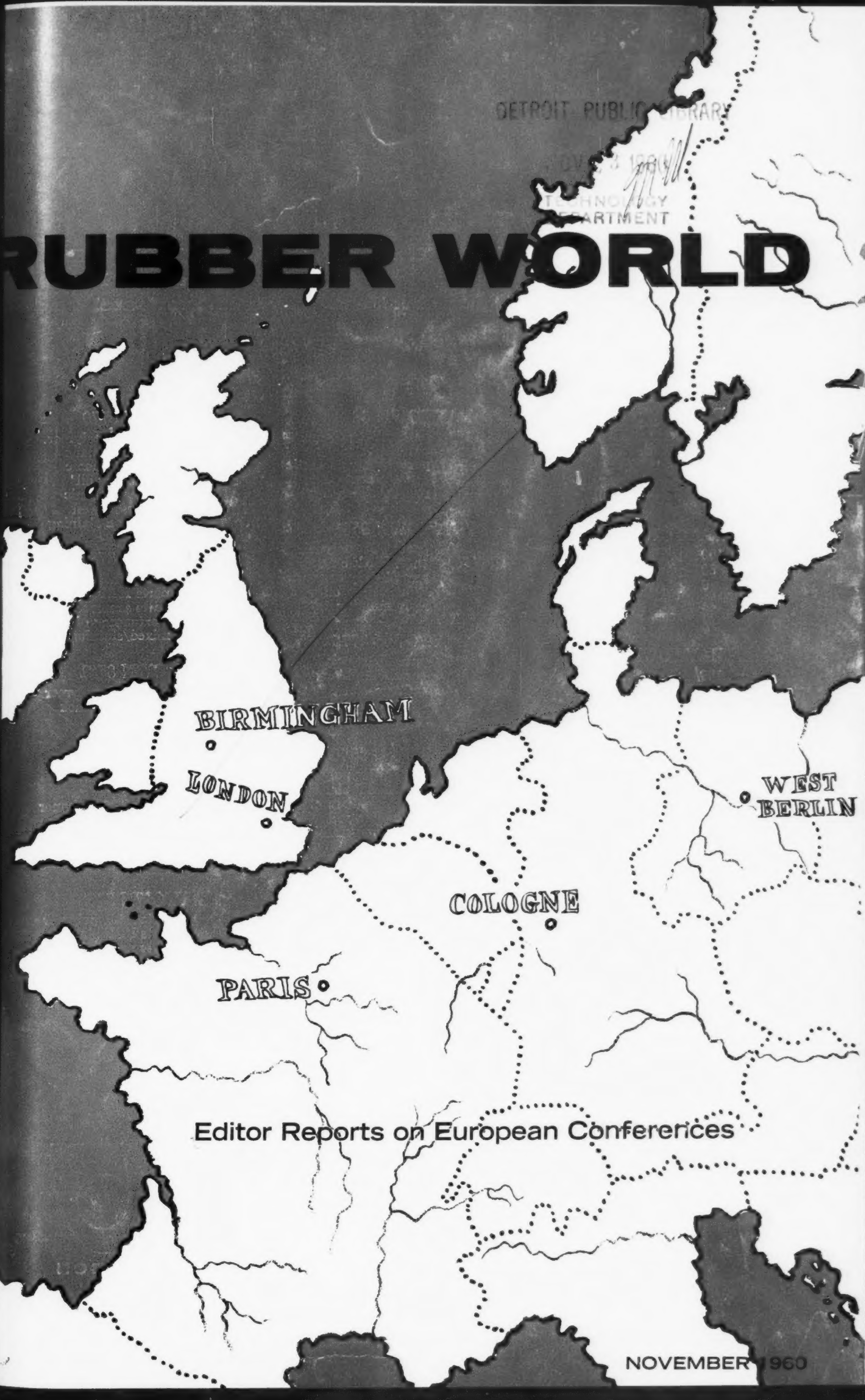
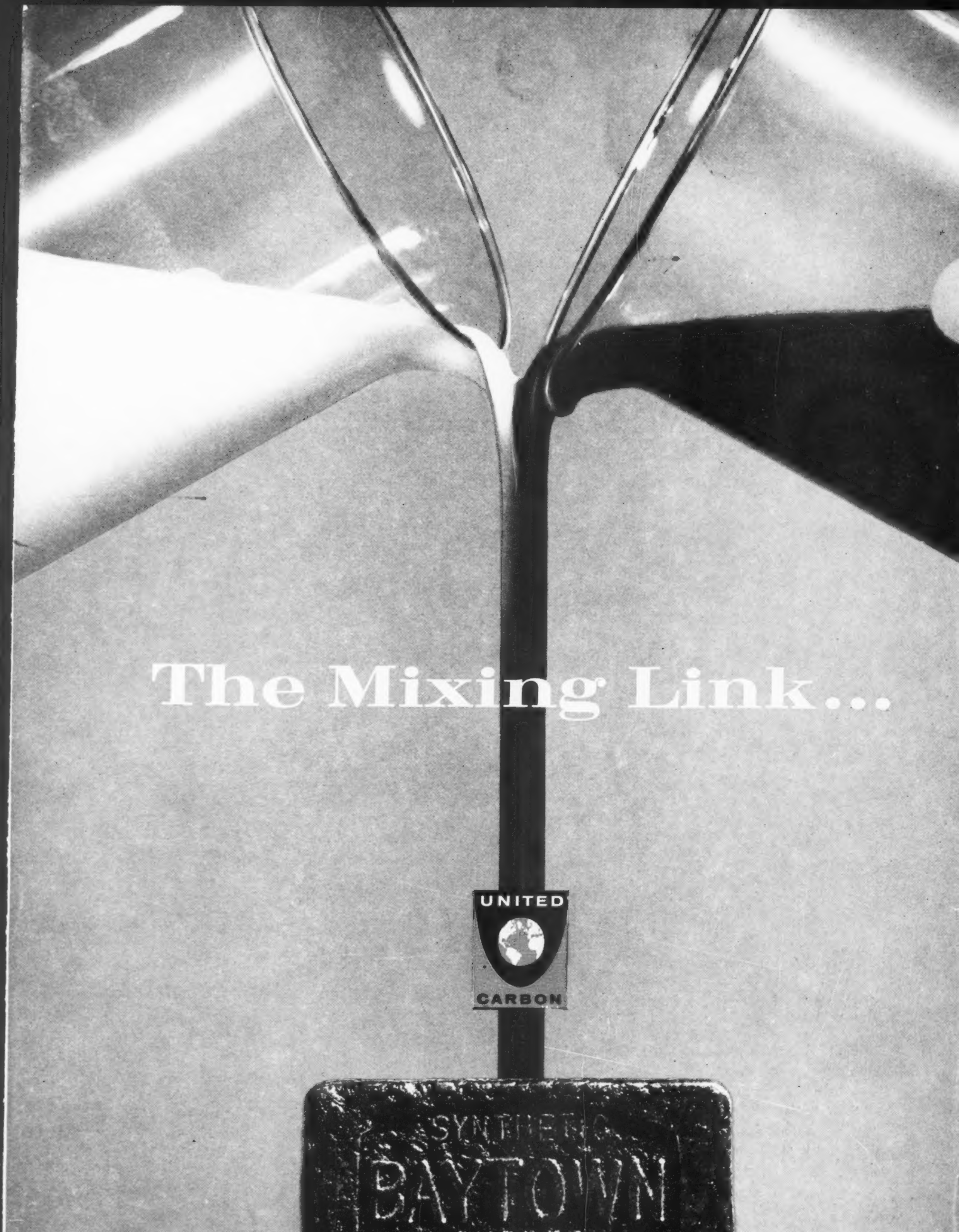
# RUBBER WORLD






Editor Reports on European Conferences

NOVEMBER 1960


The Mixing Link...
UNITED
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RUBBER

The uniquely different dispersant-free carbon black/SBR dispersion technique and UNITED-BARCLAY non-brine coagulation of the black masterbatch latex (patents applied for) combine to offer improved end-product performance, fast mixing and extrusion plus traditional handling ease historically associated with the uniformity of BAYTOWN black masterbatches.

Service Laboratory and standard commercial compounding has shown that less residual nerve remains in these new materials after mixing on conventional Banbury cycles. Fast curing and superior tensile strengths have been recorded. Extremely low ash ensuring such desirable characteristics as improved electrical properties and lower moisture absorption result from the new coagulation process.

Today there are 17 new dispersant-free BAYTOWN black masterbatches to serve you. These masterbatches and the additional ones now scheduled for full-scale commercial production have a performance potential that merit your review. We would be happy to make available samples for processing review at your convenience.

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# RUBBER WORLD

VOLUME 143 NUMBER 2 NOVEMBER, 1960

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Cover design by George Booth

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VORLD

# news of the rubber world

November, 1960

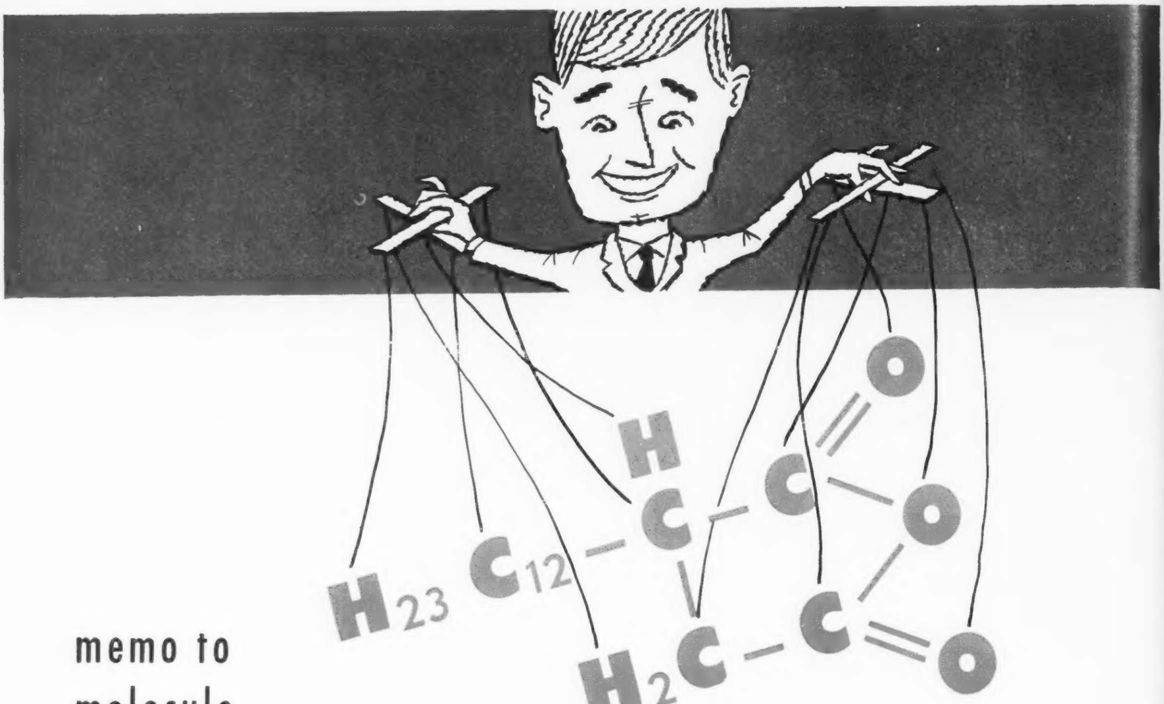
The 1960 Congress of the Deutsche Kautschuk-Gesellschaft, DKG, held in West Berlin, October 4-7, proved to be a great success. Twenty-five countries had representatives in attendance, including about 50 from the U.S.A. RW Editor R. G. Seaman, who was present, reports on that meeting on page 90. Next month Mr. Seaman will report on the Second International Synthetic Rubber Symposium sponsored by "Rubber & Plastics Age" which was held in London, October 11-13.

The West Coast will soon have local supplies of carbon black. Continental Carbon Co. has let the contract for construction of its plant announced some months ago, and United Carbon Co. has just announced plans to follow suit. There are no black production facilities in the area now.

Monarch Rubber Co. shows how, on page 78, even relatively small companies must take advantage of equipment and process improvement to save labor and time and to increase efficiency. While complete automation must remain a dream for most of these companies, many features can be utilized to reduce costs and help maintain a competitive position.

ASTM Committee D-11, Rubber, has defined "rubber." A tentative standard containing this definition and one for rubber products has been accepted. The definition, see page 83, is needed for defining scopes of projects and in trade regulations. Readers with comments are urged to send them to RUBBER WORLD, and we will forward them to the Committee.

The Third International Rubber Quality & Packing Conference, held in Singapore and one of three major natural rubber meetings in Malaya in September, also moved to reduce confusion and conflicting regulations in the rubber industry by agreeing on revisions in NR grades to yield a single set of International Standard Grades. Story on page 122.

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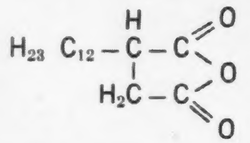
about . . . **National®**

# DODECENYLSUCCINIC ANHYDRIDE

Here is a long-chain bifunctional alkenylsuccinic anhydride with an interesting configuration on which to build new intermediates and end products.



Note particularly the three points for addition reactions as steps toward new end products. Note also the positions of the oil-soluble alkenyl group and the hydrophilic reactive anhydride end.

DODECENYLSUCCINIC ANHYDRIDE finds use as an epoxy curing agent, polyester and alkyd resin intermediate, corrosion inhibitor, etc. Many other uses are cited in the literature.

DODECENYLSUCCINIC ANHYDRIDE is one of a long line of dibasic acid anhydrides produced by National from basic raw materials wholly integrated within the Allied Chemical group. It is amply available in commercial quantities.

**WRITE FOR TECHNICAL BULLETIN I-8**

This six-page technical bulletin gives chemical and physical properties, principal reactions, infra-red absorption spectrogram, viscosity curve, suggested uses and a bibliography. A copy of this bulletin and a liberal working sample will be sent on request. Our Development Chemists will be glad to provide additional assistance to those whose work may lead to volume use of National Dodecenylsuccinic Anhydride.

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Photograph taken through the cooperation of Acushnet Process Company, New Bedford, Mass.

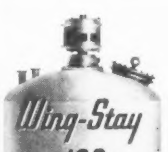
# WING-STAY 100 checks the effects of oxygen—and ozone

***It's no easy task*** to develop a good brake cylinder boot compound.

***Part of the problem*** is the frequent flexing under exposure to hydraulic fluid and heat. But equally important are the effects of oxygen and ozone degradation.

***A happy solution*** was found by one leading manufacturer in the form of WING-STAY 100. This triple-action chemical (stabilizer, antioxidant *and* antiozonant) proved most effective against atmospheric attack in extensive laboratory and field tests. Moreover, it displayed excellent processing qualities.

***Why don't you*** look into the extra protection of WING-STAY 100? Full details, including the latest *Tech Book Bulletins,* are yours at Goodyear, Chemical Division, Dept. W-9418, Akron 16, Ohio.

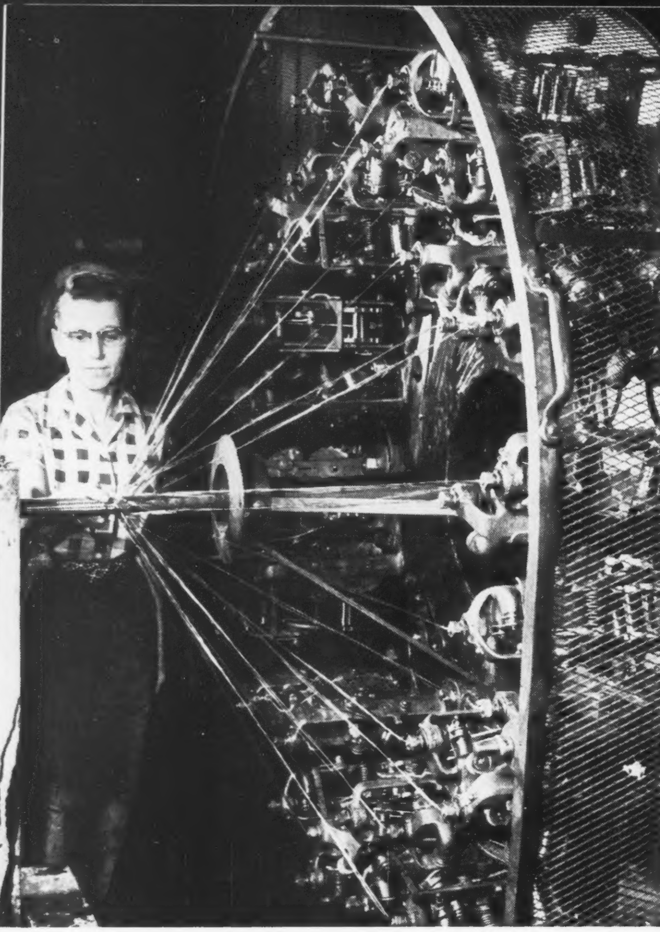



**Lots of good things come from**

**GOODYEAR**

**CHEMICAL DIVISION**

Wing-Stay—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



**B. F. Goodrich Company** braids multiple strands of steel wire into intricate sinews around rubber tube to help control and resist tremendous internal pressures required of flexible hydraulic hose. Wire such as supplied by Johnson has tensile strengths ranging from 240,000 to 400,000 psi.

**Firestone Tire and Rubber Company** uses only high tensile steel wire of exacting tolerances in building tire beads. Rapidly entering the bead machine in parallel—three to fifteen wires wide, depending on strength specified—the wires are coated with rubber. Clean bronze finish on Johnson wire assures proper rubber adhesion.

# The best names in rubber use Johnson wire for strength and safety in tires and hose

The rubber industry has a sound reputation for producing quality products in advance of its needs by use of imaginative research—painstaking development of production methods—careful selection and testing of component materials.

Goodyear—Firestone—U.S. Rubber—B. F. Goodrich—Thermoid and others have established their names over the years by giving the general public and industry alike—strength, safety and durability in products such as long lasting pneumatic tires and tough pressure hose.

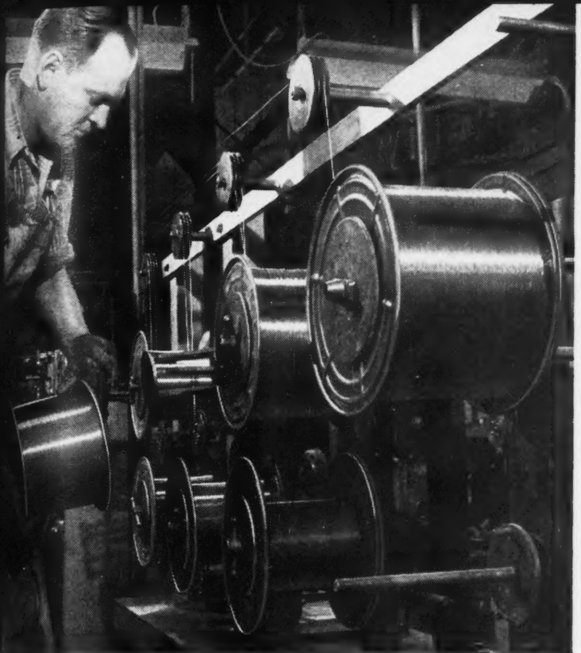
These two products owe their strength in part to the fine steel wires hidden inside them. For it is high-carbon steel bead wire which gives a pneumatic rubber tire—no matter what its size or job, the strength demanded by modern vehicles. Similar wire gives pressure hose its strong sinews which enable it to withstand working pressures as high as 10,000 psi—bursting strength may be three to four times as great.

Take the case of tire bead wire which Johnson supplies to every major tire manufacturer in the country. It is precision-drawn from special high-carbon rods to .037″ in diameter with a tolerance of only .002″—so fine that a 750-pound reel contains 39 miles of wire. Yet, a single strand exceeds 290 pounds of breaking strength equal to a tensile strength of 270,000 psi.

Also the wire must present a clean, unbroken surface and have a good and uniform bronze finish. This finish makes possible tight adhesion between the wire and the rubber surrounding it.

All these qualities contribute to the tire bead strength, help assure the safety of those who ride for work or pleasure on pneumatic tires.

Another special wire made by Johnson for the rubber industry helps rubber hose contain enormous pressures demanded by modern industrial applications. This reinforcing wire is drawn from selected high-



**Thermoid Division, H. K. Porter Company,** has cut wire rewind loss to ½ of 1% by use of Johnson Discard-a-Spool which eliminates overlaps and tangles, protects wire quality in shipment. The one-way disposable spool weighs only 28 ounces vs 200 ounces for standard spool—slashes tare weight 14 times.

**United States Rubber Company** wires tires for strength on this bead building machine. The strength comes from the steel wire bead in the edge of each tire. Johnson makes special high-carbon steel wire—.037″ in diameter with tolerance of only .002″ for U.S. and other major tire companies.

carbon steel in diameters ranging from .008″ to .020″ and has exceptional dimensional accuracy—tolerance is plus or minus .0005″.

Johnson hose reinforcement wire is supplied with a special liquor finish to provide maximum adhesion of steel to the rubber which fills the interstices between braids.

The wire is uniformly cast to make possible even spooling and has uniform tensile strength to prevent breaking under the working tension.

These excellent wire qualities, plus careful packaging and prompt delivery, have resulted in Johnson becoming a prime supplier to the rubber industry for hose reinforcement wire.

The outstanding performance of Johnson wire in the rubber industry is typical of the experience in other industries where Johnson supplies aircraft cord wire, armature binding wire, wire for brushes, metal stitching, preformed staple wire, bobby pin wire, rope wire, oil tempered and MB hard drawn spring wire, and music spring wire in a wide variety of sizes and finishes.

If you use specialty wires, call one of the offices listed to right and explore the advantages of Johnson quality which combines strength with economy.

**The Goodyear Tire & Rubber Company** finds that Johnson meets their exacting requirements for tire bead wire which has high tensile strength, twisting strength, elongation and special surface finish. Here parallel tire bead wires uncoil evenly into a bead building machine.

# Johnson Steel & Wire Company, Inc.

Worcester 1, Massachusetts

## *a subsidiary of* Pittsburgh Steel Company

**Grant Building • Pittsburgh 30, Pa.**

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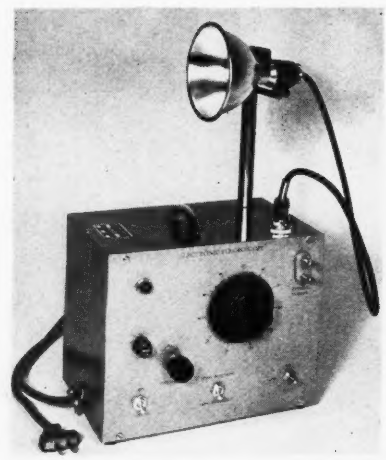
COLD
HOT
HUMID

# new equipment



Model E-30-Z stroboscope

## Wabash Stroboscope

Bachmann Associates, Clear Lake, Iowa, has introduced its new Model E-30-Z Wabash stroboscope, which can be used for control of quality to watch visually a product while it is in the moving stage of production. The stroboscope has a range of 250 to 2,500 flashes a minute, and at 1,000 flashes a minute or less is supplied with an intensifier which causes the flash tube to emit double the usual amount of light.

## New Infrared Oven

Infrared Systems, Inc., Riverdale, N. J., has introduced a new muffle oven which focuses infrared heat on the subject as it passes through an inner cylinder.

The new device has an inner cylinder with a surface that has a high capability of emitting infrared radiation. Resistance wire elements are utilized to bring the surface to radiation temperature. The device is said to provide high-speed heating with close temperature control for curing insulation on wire or cable, for curing silicone rubber, for sintering Teflon, and for heat treating rods, bars, tubing, or wire and cable.

The manufacturer also claims that the oven has accurate temperature control with a range up to 1500° C., zoned heat control, minimum heat loss,

(*Continued on page 22*)

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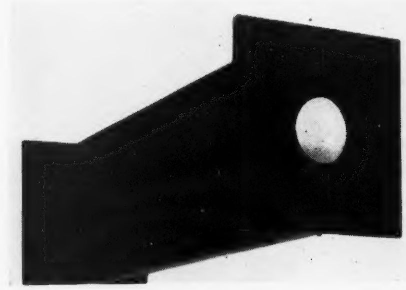
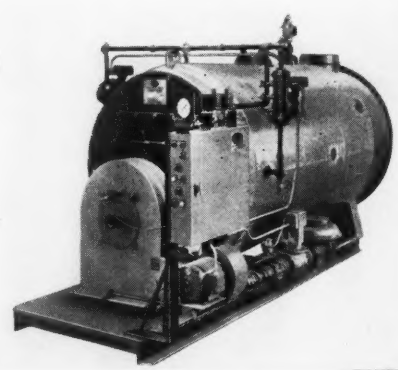
## new equipment

*(Continued from page 20)*



Infrared muffle oven

equal heating of materials of all colors, and an ability to withstand hard use. Because muffle ovens are modular in construction, they can be utilized for any length simply by bolting modules together, and in any cylinder diameter up to 20 inches, the manufacturer says.



New three-pass automatic boilers

### Eclipse Has Three-Pass Boilers

A new line of "Whispering Power" automatic three-pass Scotch Marine boilers rated at 80, 125, 150, and 200 hp. at 152 psi. has been announced by Eclipse Boiler Division, Chattanooga, Tenn.

The new boilers are available as gas-fired boilers for manufactured, mixed, natural or LP gas, and also as oil burners or combination gas and oil burners. According to the manufacturer, combustion air for the gas-fired boilers is supplied by a blower which eliminates the need of anything but a short stub stack to remove flue products from the boiler room.

The new boilers are shipped from the factory ready to be hooked up to power, steam, water, and fuel lines, and all burner and boiler safety and operating controls are included. The boilers are manufactured according to ASME boiler construction codes, the manufacturer says.

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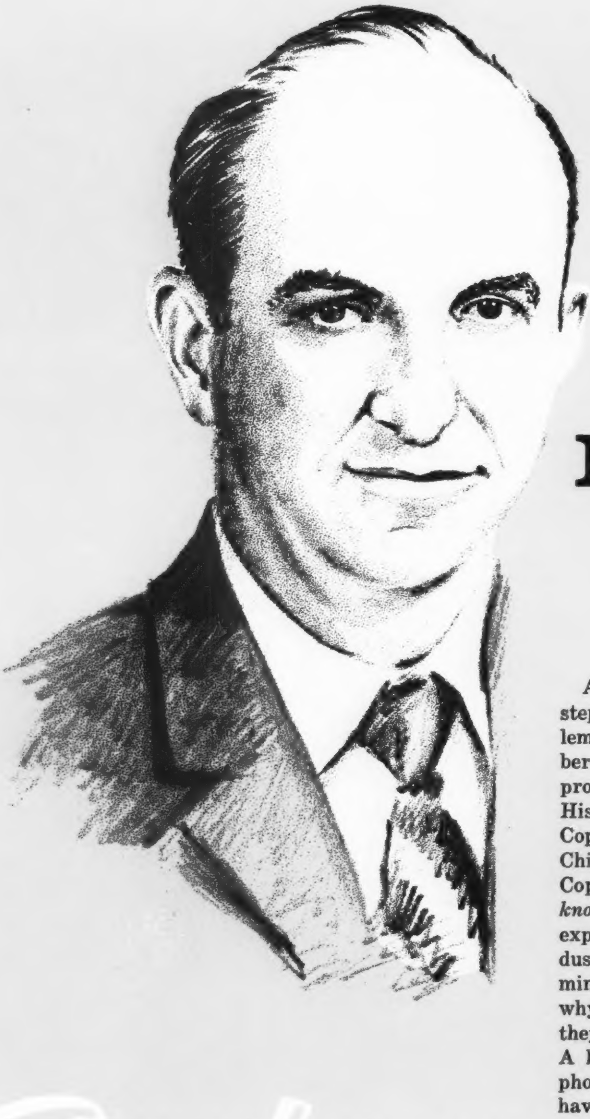

# new materials

## Low-Temperature CR

The elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., has introduced a new low-temperature CR, Neoprene WD, a product which combines maximum crystallization resistance and very high viscosity. Specifications call for good flexibility at temperatures around —65 to —70° F. Mooney viscosity at 212° F. (ML-2½) is 115 ±10.

Some physical properties of a cable jacket compound follow:

| | |
|---|---|
| Original physical properties | |
| Tensile strength, psi. | 2800 |
| 200% modulus, psi. | 1150 |
| Elongation at break, % | 350 |
| ASTM D-470 permanent set, in. | 0.08 |
| ASTM D-470 tear test, psi. | 21.3 |
| Oxygen bomb aged 4 days at 158° F. | |
| Tensile strength, psi. | 2500 |
| Elongation, % | 360 |
| Aged 18 hours in ASTM Oil No. 2 at 250° F. | |
| Tensile strength, % retained | 92.8 |
| Elongation, % retained | 65.7 |
| Brittle temperature ASTM D-746 | |
| Lowest °F. passed | −81 |

Report No. 60-2, August, 1960, concerning Neoprene type WD, is available from the company.

## M-6479, Foam-Bonding Adhesive

A new neoprene-base adhesive for bonding latex or polyurethane foam rubber is now available from United States Rubber Co. New York, N. Y. Clear in color, M-6479 Adhesive uses a delayed setting time and is said to offer dimple-free bond under slight pressure, leaving a joint stronger than the parent foam material. The product was developed at the company's Mishawaka, Ind., laboratories and is said to be low in cost, particularly for volume operations. Special joining techniques are recommended for best results.

## Strip-Ease Separating Paper

Riegel Paper Corp., New York, N. Y., has introduced a new interleaving and separating paper, said to be durable enough to permit multiple-reuse in many rubber processing applications. The new paper, called Strip-Ease, is a silicone-coated kraft. The company claims it will not stick to tacky rubber, pitch, asphalt, plastic compounds, or similar materials.

A descriptive data folder with sample is available from the company.

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THE GENERAL TIRE & RUBBER COMPANY

# new products


Neoprene spring being mounted in die

## Adhesive Aids Die

Eastman 910 Adhesive (Eastman Chemical Products, Inc.) is being used to bond neoprene springs to metal and wood in a new type of metal-stamping die, capable of cutting through steel plate one inch thick.

The die, made by Templet Industries, Inc., Brooklyn, N. Y., consists of a set of bases, one wooden and one metal, into which have been mounted steel rules with knifelike edges. The half-inch neoprene strips are mounted to the wooden base on the inside of the steel rules and to the steel base on the outside of the rules. When the two halves are brought together, the metal blank compresses the neoprene. When the dies are separated, the neoprene expands, ejecting the part and scrap.

## Silicone Insulator

Dow Corning Corp., Midland, Mich., has developed a method of using a new silicone adhesive, Silastic RTV 731, for insulation of "sore thumb" connections on silicone rubber insulated motors.

The molded connector caps, also made of silicone, are filled with Silastic RTV 731, a silicone rubber which vulcanizes at room temperature. The silicone is squeezed from its collapsible tube, and the filled caps are installed over each coil connection. Within 24 hours the RTV cures and becomes an integral part of the insulation system.

Molded silicone rubber connector caps are manufactured in various sizes by Moxness Products, Inc., and Stalwart Rubber Co.

(*Continued on page 36*)


Dr. Stanley Jankowski, one of Neville's senior chemists, is shown here holding a test chart showing the results of tensile testing three aged rubber samples. The chart is just as it came from the Instron Tester, except that scribe lines have been inked over and labeled for visability in the picture. They have not been changed. From left to right, samples contained Neville's R-16 Coumarone-Indene Resin, competitive resin A and competitive resin B. Detailed results are shown below.

# Competitive tensile test shows Neville Resin superior

Neville's R-16 Coumarone-Indene Resin was matched against two other leading resins in a neutral colored SBR test recipe compounded for comparative analysis. The results were as follows:

| | Average Tensile | Aged Average Tensile | % Tensile Retention |
|---|---|---|---|
| Neville's R-16 | 1830 psi | 1400 psi | 76.5 |
| Competitor A | 1680 psi | 1150 psi | 68.5 |
| Competitor B | 1655 psi | 1275 psi | 77.2 |

Beyond superior tensile strength, there are other benefits derived from compounding rubber with R-16 Neville Resin. Elongation, both before and after aging, is exceptional and considerable aid to processing is enjoyed. Better mold flow and easier dispersion of fillers are also realized in using R-16 Neville Resin. Use the coupon to write for further information.

**Resins**—Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Styrenated, Alkylated Phenol • **Oils**—Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents**—2-50-W Hi-Flash*, Wire Enamel Thinners, Nevsolv* • **High Purity Indene.**

*Trademark

**Neville Chemical Company, Pittsburgh 25, Pa.**

NEVILLE ®

☐ Please send information on Neville Coumarone-Indene Resins.

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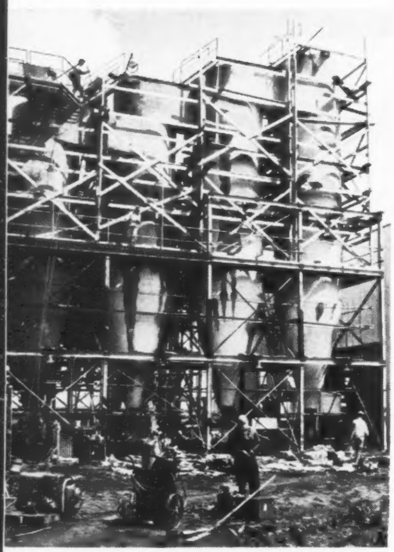
# Expansion and Modernization Protect Your

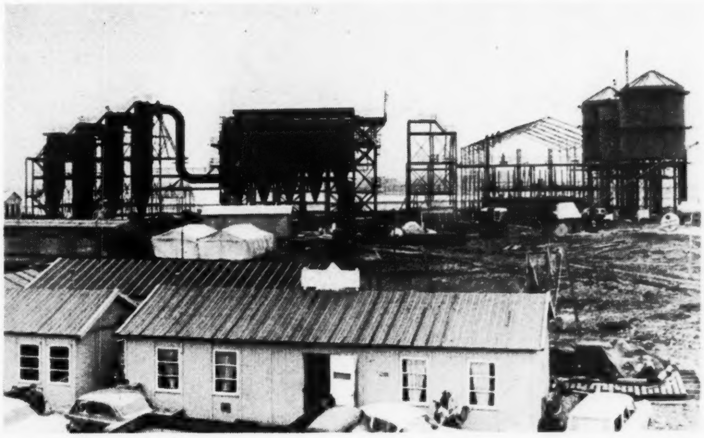


*Louisiana:* Newly completed production facilities for 25.000.000 lbs per year have just been brought on stream at Westlake to help meet the demand for premium quality carbon blacks.

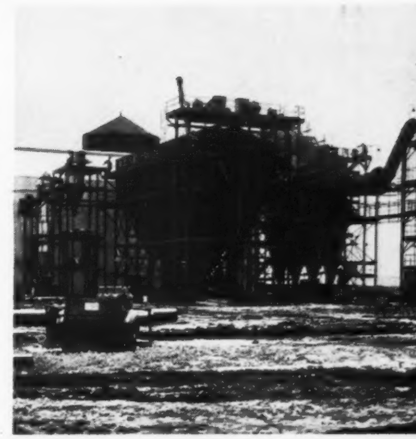
**The demand for quality carbon black by the rubber industry, both here and abroad, has reached a record-breaking level. And within the next few years, this demand is expected to increase even further. To keep pace with these carbon black requirements, Witco-Continental is engaged in a major expansion program to increase the Company's production capacity 50 per cent. New plants are being constructed in California, France and Italy, while a new plant in The Netherlands has now been completed. New additions also have recently been completed for present facilities in Oklahoma and Louisiana. Naturally, new laboratories are also being built to assure Witco-Continental customers the finest technical and other services.**

*Oklahoma:* The new facilities which were added to the Ponca City plant in 1959 increased production at this site by 25.000.000 lbs per year. This new addition has fully instrumented production controls as do all Witco-Continental plants.

# CARBON BLACK DOLLAR at Witco-Continental



*Europe:* Steadily increasing demands for Witco-Continental carbon blacks have led the company to establish plants, laboratories, and sales offices on the Continent. A 30,000,000-lb-per-year plant has been completed at Rotterdam, The Netherlands. A 56,000,000-lb-per-year plant is under construction at Bordeaux, France, and a new 60,000,000-lb-per-year plant is under construction in Trecate, Italy.

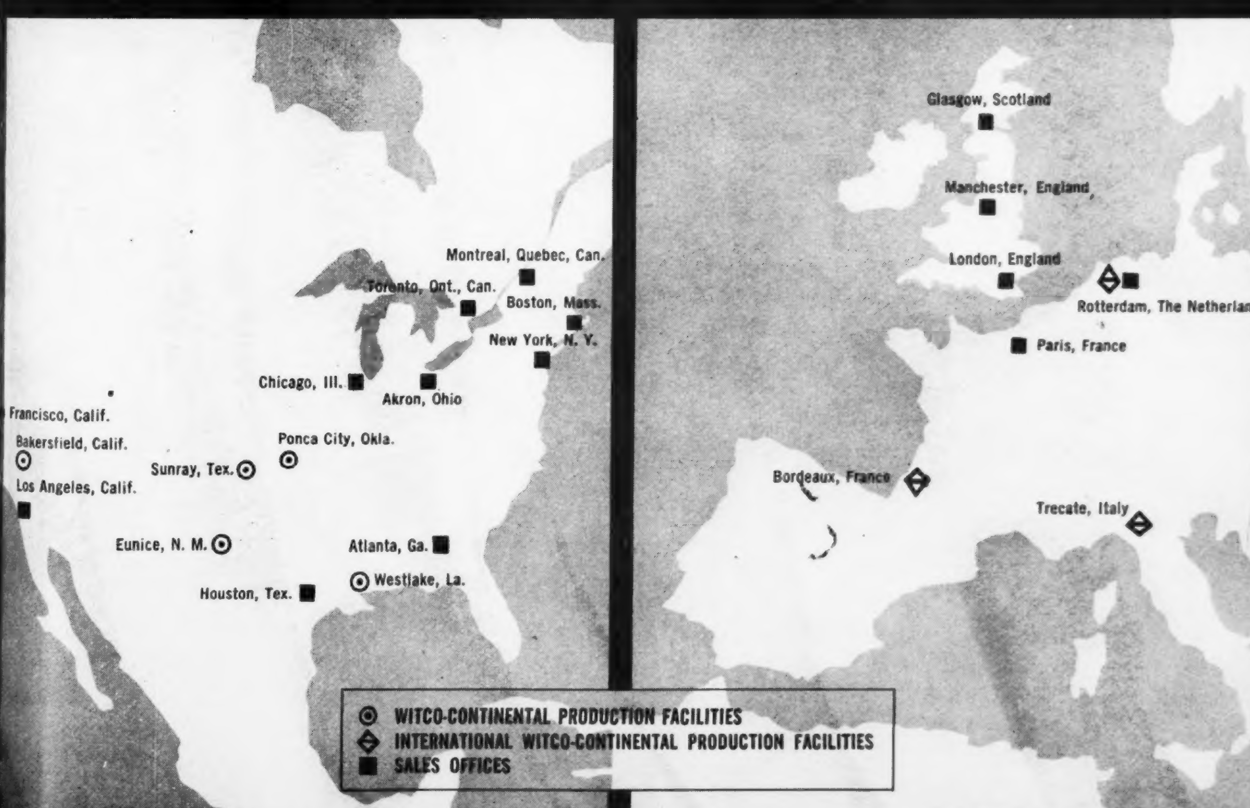


*California:* The first carbon black plant ever to be built on the West Coast will be constructed by Witco-Continental. Located at Bakersfield, California, it will produce 30,000,000 lbs of oil furnace grade blacks per year. This photograph of the new oil furnace addition at Ponca City, Oklahoma is similar to the plant being constructed in California.

**WITCO CHEMICAL COMPANY, Inc.**
**CONTINENTAL CARBON COMPANY**

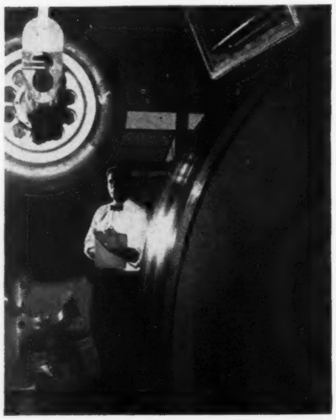
122 East 42nd Street, New York 17, N. Y.

Sales Offices in: Chicago • Boston • Akron • Atlanta • Houston • Los Angeles • San Francisco • Toronto and Montreal, Canada • London and Manchester, England • Glasgow, Scotland • Rotterdam, The Netherlands • Paris, France.



## new products

(Continued from page 32)



**Engineer checks new heat-resistant thermal tire as it leaves an oven at the Goodyear test laboratory in Akron. The huge flywheel at right spins the tire at speeds and loads to simulate landings and takeoffs**

### New Thermal Tire

Goodyear Tire & Rubber Co., Akron, O., has developed a new thermal tire which, it is claimed, will withstand temperatures of supersonic speeds that would deteriorate conventional aircraft tires.

The tire was developed in conjunction with design of a new stainless-steel research jet aircraft, the Bristol 188, for the British Government by Bristol Aircraft, Ltd., of England. The aircraft is designed to fly faster than 1,500 miles an hour.

It was explained that friction of air against the aircraft at supersonic speeds increases temperatures on the skin surfaces to much more than the range of conventional tires. Normally refrigeration equipment is used to protect tires from heat developed at these speeds, and elimination of this equipment reduces the weight of the aircraft and frees space for increased fuel supply or other equipment.

The thermal tires went through simulated tests in Akron on Goodyear's multi-stage dynamometer system, which reproduces conditions of takeoff, landing, flight, and taxiing. An oven baked the tires at maximum flight temperatures.

### Coating for Motor Windings

Silicone rubber that vulcanizes at room temperature is used to encapsulate motor windings and can be applied in rewinding shops to protect motors from moisture, chemicals, abrasive dust, and other contaminants, the silicone products department of General Electric Co., Waterford, N. Y., reports. The RTV (room-temperature vulcanizing) rubber can be applied either by a mold method or by spreading it on with spatulas, much as one frosts a cake. The material cures within 24-48 hours.

Further information is available in the company's booklet CDS-254.

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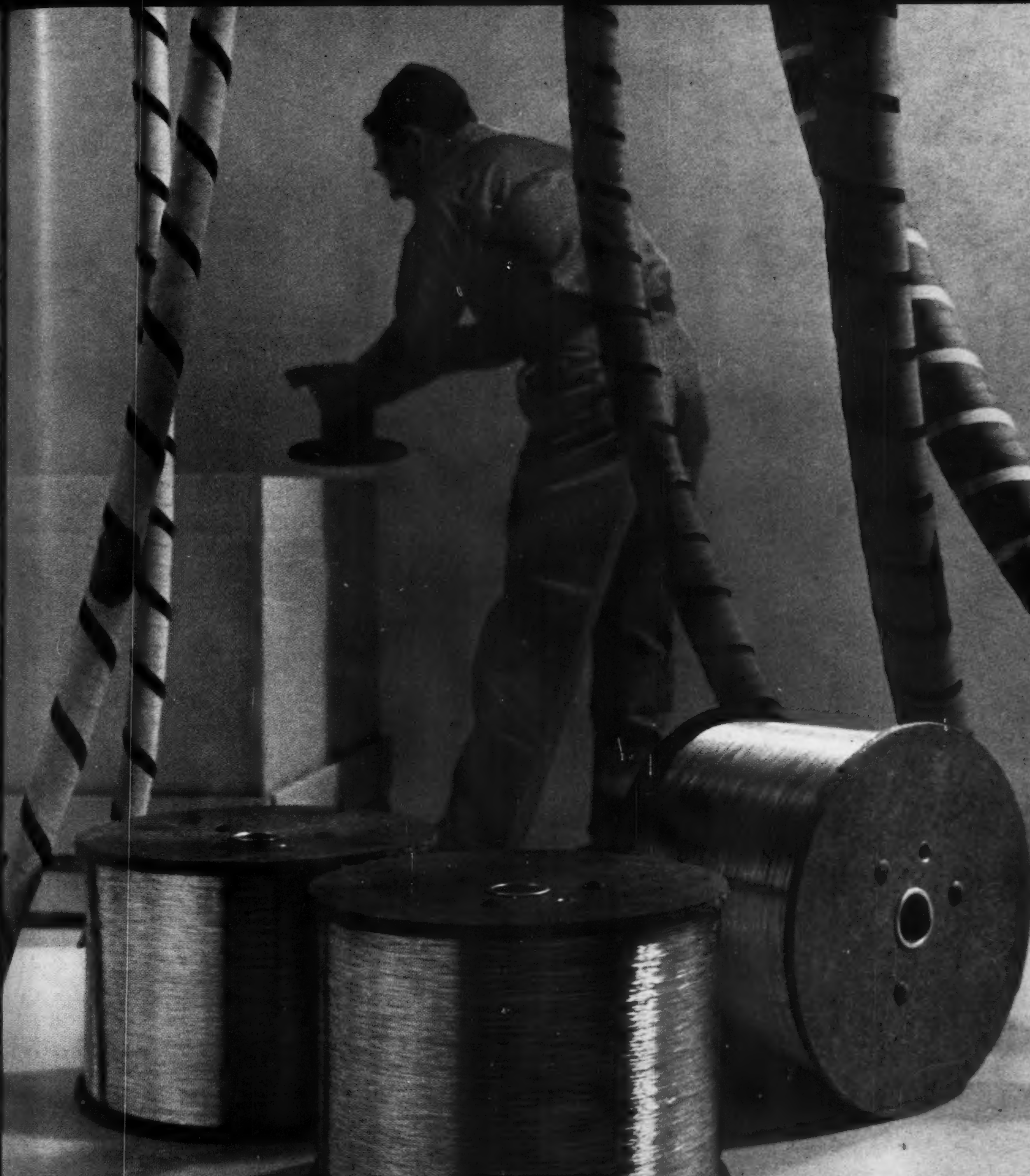


***News about***

# B.F.Goodrich Chemical *raw materials*


*Endicott Johnson Corporation, Endicott, New York, makes these shoes using Hycar. The plain soles are oil-resistant and non-conductive. The soles with the green spot are oil resistant, made for Lehigh Safety Shoe Company. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.*

## Shoe soles get more "sell" from Hycar

**Standing up on oily** or greasy floors calls for a shoe sole that really stands up—which is why these soles are made of Hycar nitrile rubber. Oils, solvents and corrosive chemicals that would quickly destroy ordinary rubber aren't a problem when you use Hycar.

**Abrasion resistance** is outstanding under any conditions, and on oily floors shoe soles made with Hycar outwear ordinary rubber many times. Also, Hycar is easy to process, an added advantage for shoe sole manufacturers.

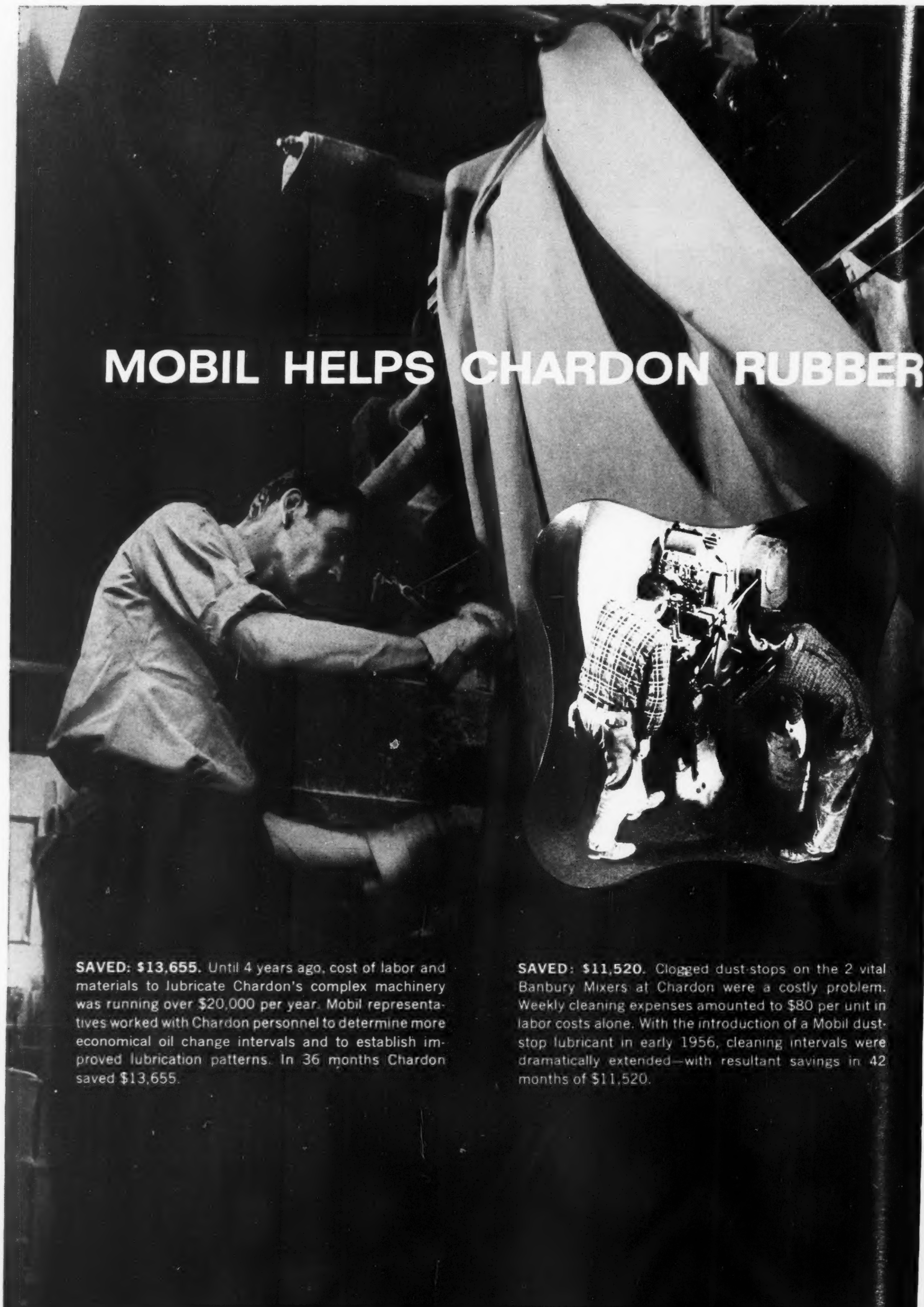
**Hycar is often** the answer to tough product problems. It gives new advantages and simplifies processing, often helping improve a product or opening whole new markets. For more facts, write Dept. FA-8, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

**Hycar**

*Rubber and Latex*

**B.F.Goodrich Chemical Company**
**a division of The B.F.Goodrich Company**

**B.F.Goodrich** GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers


MOBIL HELPS CHARDON RUBBER
SAVED: $13,655. Until 4 years ago, cost of labor and materials to lubricate Chardon's complex machinery was running over $20,000 per year. Mobil representatives worked with Chardon personnel to determine more economical oil change intervals and to establish improved lubrication patterns. In 36 months Chardon saved $13,655.
SAVED: $11,520. Clogged dust-stops on the 2 vital Banbury Mixers at Chardon were a costly problem. Weekly cleaning expenses amounted to $80 per unit in labor costs alone. With the introduction of a Mobil dust-stop lubricant in early 1956, cleaning intervals were dramatically extended—with resultant savings in 42 months of $11,520.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# technical books

## BOOK REVIEWS

**"Engineering Design with Rubber."** A. R. Payne and J. R. Scott. Cloth, $5\frac{3}{4}$ by $8\frac{3}{4}$ inches, 256 pages. Interscience Publishers, Inc., New York, N. Y. 1960. Price $8.00.

This book is an amplified account of the material presented at a three-day symposium on "Dynamic Design with Rubber" held in 1958 under the auspices of the Research Association of British Rubber Manufacturers to assist in disseminating the knowledge gained in their broad research program on the engineering uses of rubber, especially its behavior under rapidly changing stresses, shock, and vibration. One of the purposes of the book is to provide a practical manual for everyone concerned with the use of rubber in engineering design.

The book does not have the character of an engineering handbook, but is an excellent presentation of the subject for the engineer or rubber technologist who likes to work from basic principles and to have a real understanding of rubber-like behavior so that he can use these materials most intelligently. It gives more consideration to synthetic rubbers than is usual with British books on such subjects.

The form, scope, and organization suffer somewhat because the book is based on the proceedings of a symposium. The book will be most helpful when it is a constant companion and after the user is thoroughly familiar with its contents and has an appreciation of how much information it contains and where to look for it. As an example, the useful relation between durometer hardness (in this case, British Standard degrees) and modulus is found in the last table in the appendix, in the form of a graph on page 220 and as an equation on page 123. Such situations are, however, ameliorated by a good subject index.

The description of the dynamic properties of rubber and dynamic test methods and machines is presented with more detail than is probably justified from strictly engineering standpoint, but it is an excellent account of the subject with fine attention to the principles. The interrelations of frequency or rate of deformation and temperature, i.e., the method of reduced variables is especially well explained and illustrated in connection with all of the viscoelastic aspects of rubber behavior such as vibration, creep, and stress relaxation.

The treatment of the force/deformation relations for the various modes of deformation of cylin-

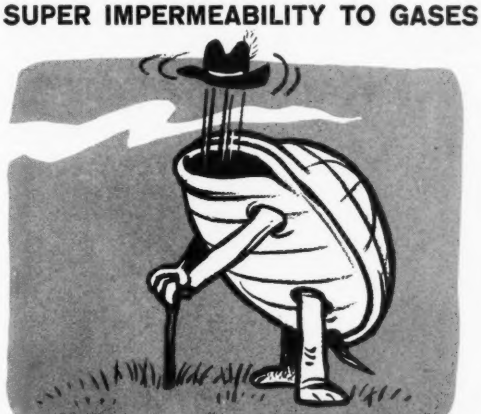
*(Continued on page 48)*

# When rubber parts must deliver...

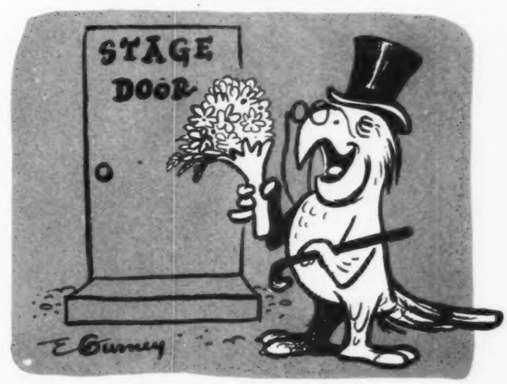
**HIGH RESISTANCE TO SOLVENTS**

**LOW TEMPERATURE FLEXIBILITY**

**SUPER IMPERMEABILITY TO GASES**



**LONG, LIVELY LIFE**




# THIOKOL POLYSULFIDE CRUDES are

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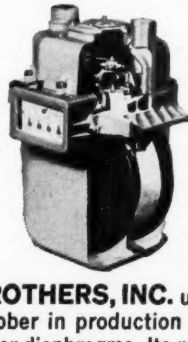

**REEVES BROTHERS, INC.** uses THIOKOL polysulfide rubber in production of Reeves-Vulcan gas meter diaphragms. Its resistance to oils, organic solvents and impermeability to gases assure accurate metering.

*High resistance to organic solvents, dilute acids, alkalies, and aromatic fuel. Impermeability to gases, moisture, liquids. Low temperature serviceability—to -60°F without plasticizers. Resistance to ozone, sunlight, weathering over long periods of time, without serious loss of serviceable properties.*

Good reasons why THIOKOL polysulfide crudes are widely used in printing and coating rollers, solvent, paint and fuel hose, diaphragms and gaskets. Perhaps they hold the answer to improved product processing for you. Want the facts and technical assistance? Write to THIOKOL at address below.

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## technical books

(*Continued from page 44*)

drical rubber bushings is unusually comprehensive. However, the treatment of the compression deformation of various shapes of flat rubber pads is based on the use of an equation derived from theory together with empirical shape factors given in a table. This approach is probably not so convenient as the conventional, entirely empirical system of charts and curves usually used.

The chapter on the isolation of vibrations by means of rubber mountings is especially well done and includes a discussion of the principles for decoupling modes of vibration of the isolated system.

The acquisition of additional information on any of the subjects discussed in the book is facilitated by a list of pertinent references at the end of each chapter.

The book will probably be a leading reference work in its field for a long time to come.

S. D. GEHMAN

**"Kautschuk-Handbuch."** Volume I. Edited by Siegfried Bostrom. Published by Berliner Union G.m.b.H., Stuttgart, Germany. 1959. Plastics cover; 6¼ by 9 inches; 448 pages; 152 illustrations.

Designed to take the place of Hauser's "Handbook of Rubber Technology," long out of print, the new rubber handbook—compiled in collaboration with more than 40 specialists of leading German, Italian, and Austrian companies—is to be made available in four volumes. This Volume I is the second to be printed. It describes in 13 chapters and numerous sub-sections the different types of natural and synthetic rubbers, their properties, curing methods and curing aids, and gives details of the development of the synthetic materials, to 1958, chiefly in the United States, Canada, and Germany. The economic importance of rubber in American, Asian, and European industry is discussed, country by country, and illustrated by consumption figures to 1957. Helpful and often extensive bibliographies are appended to each chapter.

The print of the book is clear, and the plastics cover neat and utilitarian, but—surprisingly for a reference book—the binding work does not seem very sturdy.

Of the other three volumes, Volume III was the first to be published, and is devoted to rubber technology; manufacturing processes for tires, mechanical goods, footwear, toys, cellular rubbers, thread, erasers, and floorings are described in some detail. Volume II will deal with PVC, butyl rubber, Oppanol, silicones, reclaim, compounding ingredients, and manufacturing aids, textiles, and machinery. The final volume, IV, will consider, among others, belting, hard rubber, rubber-to-metal bonding, dipped goods and rubberized fabrics, latex technology, and chemical and physical tests.

The price for the set of four volumes will be 360 DM., if ordered before the last volume is issued; thereafter the price will be at least 380 DM. The volumes will not be sold separately.

# technical books

## NEW PUBLICATIONS

**"Philprene Polymers."** Phillips Chemical Co., Akron, O. 18 pages. This publication lists physical and chemical properties of seven SBR copolymers, including hot, cold, pigmented, unpigmented, and oil-extended types.

**"Better Power for Production."** Bulletin GEA-7139. General Electric Co., Schenectady, N. Y. 48 pages. This booklet covers in some detail considerations for setting up plant power distributions systems, including persons to be consulted in determining plant requirements, choosing voltages, short-circuit calculations, protective relaying, selection of unit substations, power factor corrections, and grounding.

**"Resistance of Hycar Rubber to Immersion Media."** Manual HM-6. B. F. Goodrich Chemical Co. 16 pages. This is a collection of tables showing a general study of volume change of two Hycar vulcanizates at various times up to 90 days' immersion in many types of immersion media, and the effect of both common industrial chemicals and commercial refrigerants on the two Hycar vulcanizates.

Publications of Dow Corning Corp., Midland, Mich:

**"Silastic Stocks and Pastes Classified by Properties and Uses."** 1 page.

**"Specifications Involving Silastic."** Bulletin U-9-110. 4 pages. This bulletin lists raw material specifications and military and non-military or commercial parts and finished goods specifications, with recommended Silastic stocks or blends of stocks to meet specifications. It replaces a previous bulletin, "Silastic Stocks for Various Specifications."

**"Effects of Heat on the Physical Properties of Silastic."** Bulletin U-9-107. 3 pages. This folder discusses immediate heat effects and heat aging effects on silicone rubber, with graphs.

**"Low-Temperature Testing of Silastic."** Bulletin U-9-112. 3 pages. Described are results of three standard low-temperature tests on three main types of Silastic.

**"Silastic as an Electrical Insulating Material."** Bulletin U-9-114. 3 pages. Covered are electrical properties of general-purpose Silastic at various temperatures, also the effects of heat aging on these properties.

**"Silastic LS-53."** Bulletin 9-379a. 3 pages. This bulletin lists standard physical and electrical and oil resistance properties of LS-53, a fluorosilicone rubber. It replaces Bulletin 9-379.

**"Silastic 140 Adhesive."** Bulletin 9-407a. 2 pages. Topics include use, cure time, bond strength, and other properties of this adhesive.

**"Reclaiming Silastic."** Bulletin U-9-109. 2 pages. This bulletin gives instructions on in-plant reclaiming of Silastic, blending with new stocks, and physical properties of the reclaimed product.

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GLYCERIZED
(LIQUID CONCENTRATE)
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PREVENTS STICKING
Slabbed or Sheeted Storage
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A microscopic film of
GLYCERIZED LUBRICANT
You won't be able to see it on the rubber but you will know of its presence because of the non-adhesive properties it imparts. Does not interfere with tack or knit of stock.
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1 DRUM MAKES UP TO 50 DRUMS OF WORKING SOLUTION
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CHICAGO 32, U.S.A.
Also Mfgrs. of RUBBEROL SYNTHOL MICROFLAKE

## technical books

**"The Profitable Present and the Fabulous Future of Urethane Foams."** Mobay Chemical Co., Pittsburgh, Pa. 26 pages. This booklet traces the development of urethane foams and outlines in a non-technical way some of the applications of the materials.

**"Tote."** Tote System, Inc., Beatrice, Neb. 32 pages. This catalog describes the Tote system of metal containers plus filling and discharging equipment, explaining storage, discharging, in-plant use, weighing, and transportation by truck, train, or barge.

**"Rotovisko Electrical Rotary Viscosimeter."** Leaflet 105/5e. Brinkmann Instruments Inc., Great Neck, L. I., N. Y. 12 pages. This publication describes operation and applications of the Haake Rotovisko, electrical rotary viscosimeter, distributed in the United States by Brinkmann Instruments.

**"Porous 'Teflon' and 'Kel-F'."** Bulletin P-103 Porous Plastic Filter Co., Inc., subsidiary of Pall Corp., Glen Cove, N. Y. 4 pages. The bulletin lists chemical and physical properties of porous "Teflon" and "Kel-F" and standard sheets, disks, and custom forms available.

**"The All-Purpose Ball-Bearing Rotary Union."** Bulletin No. 700. Perfecting Service Co., Charlotte, N. C. 20 pages. This catalog describes models of the Rotary Union, both stock and special models, adapters, and other products made by the firm, including lubricants, flexible hose, and air control equipment.

**"Fuller Equipment for the Chemical Processing Industries."** Bulletin GD-38. Fuller Co., Catasauqua, Pa. 12 pages. This bulletin lists applications and performance characteristics of pumps, pneumatic conveyors, fluidizing conveyors, rotary compressors and vacuum pumps, horizontal-grate coolers, suspension-type preheaters, positive displacement blowers and gas pumps, and induced draft fans.

**"Statistical Data Reduction and Control Systems."** Technical Memorandum No. 1. Monitor Systems, Inc., Fort Washington, Pa. 9 pages. This bulletin discusses methods for increasing efficiency of data reduction and automation systems for quality control, continuous processing, and large-scale experimental work.

**"Testing U. S. A."** Testing Machines Inc., Mineola, N. Y. 4 pages. This is a new bimonthly publication. The current copy contains brief items on temperature monitoring systems, a packaged constant-temperature and humidity laboratory room, special-purpose weighing scales, a variable-speed laboratory motor, impact testing and other items, referring to other TMI bulletins which carry detailed information.

# how to vastly increase the useful life of rubber...

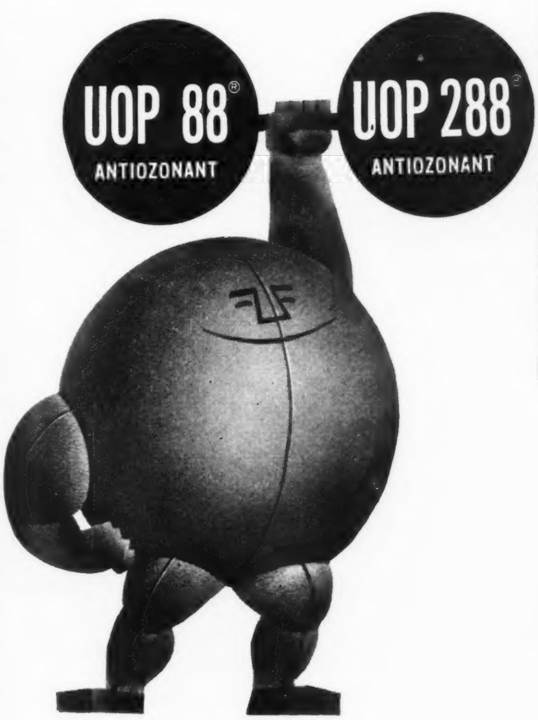
**Consider the effect of your curing system on the effectiveness of a chemical antiozonant**

In compounding rubber, use of a potent antiozonant like UOP 88 or 288 is essential in assuring maximum crack-free life. But do you realize what a vast difference may be made by your *curing system?*

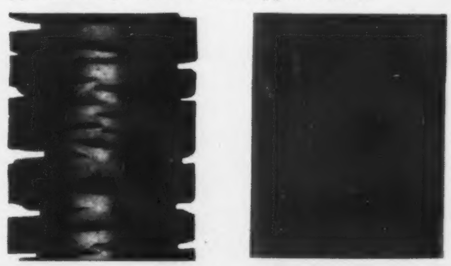
Look at the two rubber test strips illustrated. Both were formulated with UOP 88 . . . but note how much more effectively the antiozonant worked when accompanied by this change in curing systems —a vast increase in resistance to cracking!

Help in achieving maximum effectiveness from UOP 88 or 288 antiozonants is available through UOP facilities and technical personnel. Just write or telephone our Products Department.


UOP ozone cabinets provide test conditions at a wide range of ozone concentrations.




**The SBR specimens below were exposed to ozone at 100°F with 20 percent elongation for 52 hr. at 33 pphm ozone, then 187 hr. at 63 pphm ozone.**



**Carbon black—HAF** (high abrasion furnace), Curing system — 4 phr tetramethylthiuram disulfide; Hours to first crack—7 to 23.

**Carbon black—HAF** (high abrasion furnace), Curing system—2 phr sulfur, 1 phr N-cyclohexyl-2-benzothiazole sulfenamide. No cracks in 239 hr.

**UNIVERSAL OIL PRODUCTS COMPANY**

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WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

**IN ACID-PROOF HOSE.** The Butyl jacket and liner of this hose offer high resistance to most acids, chemicals, abrasion and weathering.

**IN WORK RUBBERS.** Thanks to Butyl, these rubbers are resistant to chemicals, moisture, abrasion . . . and slipping.

**IN COLLAPSIBLE TANKS.** These units of Butyl which resist many chemicals, abrasion and weathering, convert flat-bed trailers into large capacity liquid carriers in just minutes.


**YOU GET EXPERT TECHNICAL ASSISTANCE.** The Enjay staff of Butyl experts – backed by the resources and knowledge of one of the world's great research laboratories – are always ready to serve you.

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In many applications, Enjay Butyl outperforms all other polymers and elastomers known to the chemical industry.

Butyl is the preferred rubber for countless types of hoses, tank linings, gaskets, seals – and many other applications where exacting chemical resistance is required.

Other features of Butyl rubber –such as its resistance to tear and abrasion, sunlight and weathering, as well as the damping, electrical and dielectric properties – are responsible for the selection of Butyl rubber in many varied applications.

Typical of these is the proved success of the all-Butyl passenger tire where Enjay Butyl rubber provides such features as no-screech on turns and fast stops

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– added traction and stopping power and quieter ride with maximum shock absorption.

Butyl is the "idea" rubber with uses stretching as far as the imagination can reach. We'll be glad to tell you all about it. Just contact the nearest Enjay office. *Home Office:* 15 West 51st Street, New York 19, N. Y. *Other Offices:* Akron • Boston • Charlotte Chicago • Houston • Los Angeles New Orleans • Plainfield, N. J. Southfield, Mich. • Tulsa

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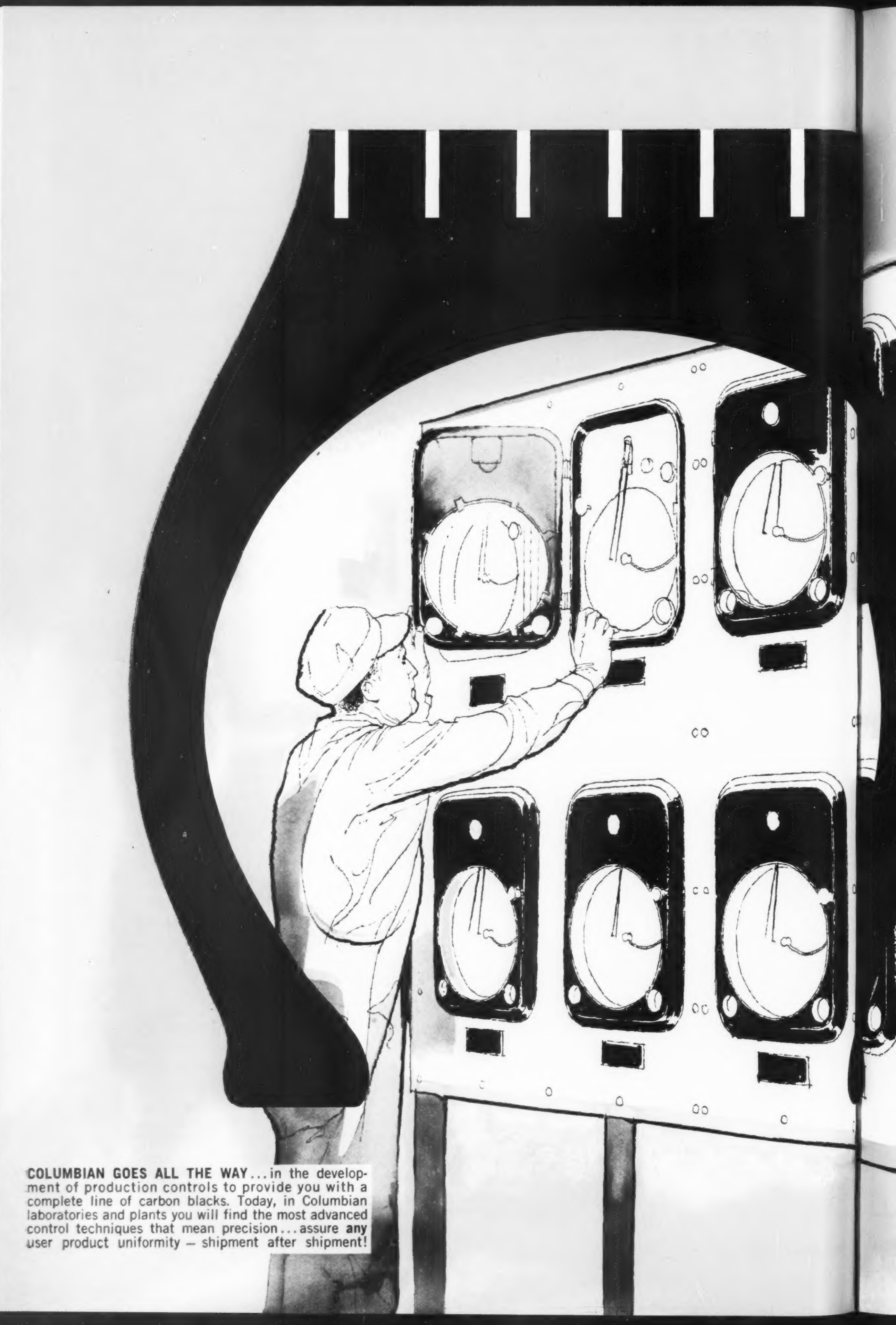

## editorial

# Should International Rubber Meetings Be Coordinated to a Greater Extent?

Would it be possible and desirable to attempt to increase the coordination between various technical organizations in the field of rubber in connection with international meetings? What should be the scope of such meetings; where should they be held; and what should be done about the language problem?

During the first week in October the German Rubber Society held an international meeting or Congress in West Berlin. The following week the Second International Synthetic Rubber Symposium organized by *Rubber and Plastics Age* was held in London. The editor of RUBBER WORLD had the privilege of attending both of these meetings and observing the scope of the programs and the many excellent papers presented. Meanwhile, on the other side of the world, the Rubber Research Institute of Malaya was holding a Natural Rubber Conference in Kuala Lumpur.

The West Berlin meeting included some papers on natural rubber; while the London meeting was devoted entirely to synthetic rubber. At Kuala Lumpur the papers were, of course, all on natural rubber. The first two meetings were accompanied by exhibitions of rubber processing and testing equipment; the West Berlin meeting included exhibits on the use of synthetic fibers, and the London meeting had exhibits of raw materials and compounding ingredients.

In general, we feel that an excellent pattern for international rubber conferences was set at the American meeting in Washington, D. C., in November, 1959, in a program which included papers on both natural and synthetic rubbers, rubber chemistry and physics, polymerization, testing, products, and rubber processing and equipment.

We feel also that to be of maximum benefit to most members of the worldwide community of rubber scientists and technologists, international rubber meetings should be held in England, on the Continent of Europe, or in North America.

The German Rubber Society has announced that its next international meeting will be held in 1964. *Rubber and Plastics Age* is planning another international synthetic rubber meeting also in 1964. The Institution for the Rubber Industry, which has been a pioneer in international rubber meetings, will hold its fourth such meeting in London in 1962.

The editor of *Rubber and Plastics Age* suggested recently that consideration should be given to the formation of an international clearing house for conferences and exhibitions dealing with both rubber and plastics, and that he felt that the Research Association of British Rubber Manufacturers is well suited to act in this capacity. We agree that it would be highly desirable to make an attempt to coordinate meetings of international character on rubber, but question the advisability of including plastics in the scope of the programs. An international rubber and plastics meeting could become too large to be practical.

We would appreciate hearing from readers of RUBBER WORLD with regard to their attitude on international rubber conferences and whether or not they feel that the international clearing house, as suggested by *Rubber and Plastics Age*, is a desirable project. Certainly anything that can be done to provide for better international rubber meetings, properly timed and located, is worth some extra effort and thought by rubber scientists and technologists all over the world.

R. G. Seaman

EDITOR

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# The CEPAR Apparatus[1]

*(Cure, Extrusion Plasticity, and Recovery)*

# A Versatile Instrument for Measuring Processing Characteristics of Rubber Mixes

**Elastic stiffness, orifice flow resistance, hot recovery, and extruder swell may all be measured in a rapid and continuous manner on this new apparatus and may be used to evaluate and control factory operations with many rubber stocks**

By F. S. CONANT and W. E. CLAXTON

*Firestone Tire & Rubber Co., Akron, O.*

THE ease and efficiency with which elastomeric materials may be concerted from a raw polymer state to a compound and form ready for vulcanization may be designated by the general term "processability." Since a great many factors enter into processability, such as milling energy required, breakdown time, scorch characteristics, ease of incorporation of pigments, smoothness of formed or extruded articles, and their deformation with time, it is not surprising that a number of different tests have been developed for its evaluation. These tests have been well summarized by R. D. Dinsmore and A. E. Juve,[2] who emphasized that the selection of processability test methods must be based on the conditions employed in each specific factory operation. In other words, each of the tests in common use provides information on a limited phase of the problem.

The test described in this paper enables measurements to be made of several of the more important processing variables in a rapid and continuous operation. These include elastic stiffness factor, resistance to orifice flow, hot recovery, flow scorch, and swelling of extruded material.

## Description of Apparatus and Test Methods Data Processing

The basic apparatus may be used to perform tests in two distinct categories, evaluation of curing and of processability characteristics of elastomers. Because of its dual use this device has been termed the CEPAR (cure, extrusion plasticity, and recovery) apparatus.[3] Only a separate insert in the test chamber is required to change from one type of test to the other.

A sketch of each insert is shown in Figure 1. In the first unit on the left of Figure 1 the extrusion plasticity and recovery insert is shown in the test chamber. Also shown is a portion of the loading arm through which the extruding force is applied.

The second unit on the right of Figure 1 shows the insert for the curing tests. The plunger shown embedded in the test specimen deflects, upon load application, to an extent determined by the state of cure of the specimen.

The scope of the present discussion is limited to the application of the extrusion phase of the CEPAR apparatus to the study of processability of elastomers. In this use the CEPAR apparatus is essentially an extrusion plastometer operating at a chosen constant relatively low load, with provisions for heating the specimen and for measuring the loading arm deflection at any given time after applying or removing the active load. An extruding force is applied to the test specimen when a load cam is rotated so that the unbalanced

[1] Paper presented before the Division of High Polymer physics, APS, Detroit, Mich., Mar. 24, 1960.

[2] "Synthetic Rubber," Chap. 11, pp. 381-382. Edited by G. S. Whitby, C. C. Davis, and R. F. Dunbrook. John Wiley & Sons, Inc., New York (1954).

[3] W. E. Claxton, United States patent No. 2,904,994 (1959).

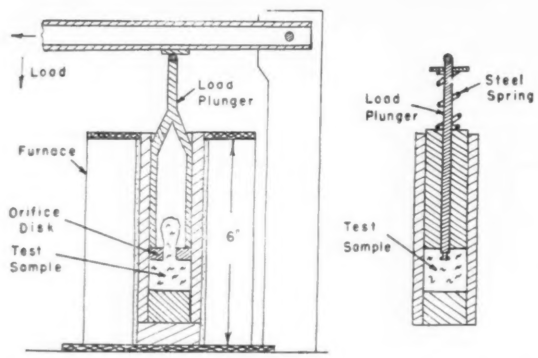



Fig. 1. Sketch of CEPAR apparatus. On the left the extrusion plasticity and recovery insert is in the test chamber. On the right is the insert used for the evaluation of cure characteristics

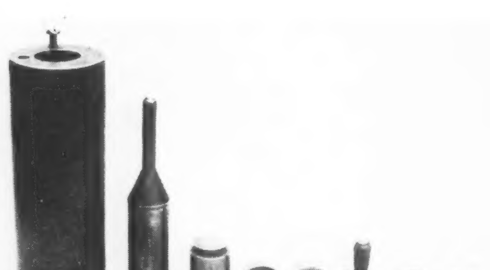


Fig. 2. Heating cavity unit showing orifice load plunger-specimen assembly

beam is lowered on plunger. Cycling timer controls can be adjusted to rotate the cam or to turn on the recorder chart drive with load continuously applied, at intervals of from one minute to 60 minutes as may be desired.

The 3.5- to 4.5-gram test specimen is preformed cold into an approximately cylindrical shape, 0.75-inch diameter by 0.5-inch high to fit into the test cavity shown in Figure 1, *left*. A disk-type slug having a central orifice ⅛-, ¼-, ⅜-, or ½-inch diameter is loaded on top of the rubber sample, and a chosen load applied. After the sample has been compressed to an initial reference zero (some extrusion occurring thereby), abrupt application of a greater load to the orifice disk causes an instantaneous deflection which is related to the elastic or time independent deformation properties of the material. Continued load application results in a continuous extrusion at a nearly constant rate, the reciprocal of which is a measure of the flow resistance, $N_f$. Upon removal of the load the extruded portion of the material tends to retract through the orifice, thus forcing the disk upward and providing a measure of hot recovery. After removal of the specimen from the test chamber the diameter or length of the extruded portion can be measured. A heating cavity unit with the various inserts and a tested sample is shown in Figure 2.

Each test chamber fits loosely into an electrical heating unit which is controlled individually by a contact relay meter through a thermocouple inserted in the inner chamber wall. Temperature variations at the thermocouple are held to ±1° F. during normal operation.

A measure of orifice extrusion or of hot recovery is obtained on a strip chart recorder. For this measurement a core of easily magnetized material is suspended from the free end of the loading beam and extended into a motion transmitter coil. Machine constants are such that a plunger motion of 0.1-inch produced 85% of full-scale deflection on the recorder. A motion of 0.1-inch of the ¼-inch-diameter orifice disk results in an extruded length of about one inch of the sample specimen. The recorder chart drive may be started automatically when the load is dropped by the rotating cam, or it may be controlled manually through use of a toggle switch provided for this purpose.

An overall view of the four-station apparatus is shown in Figure 3.

## Data Processing

A typical chart obtained in the determination of elastic stiffness, $M_f$, flow resistance, $N_f$, and hot recovery, R, is reproduced in Figure 4. Elastic stiffness factor, $M_f$, is a CEPAR index related more closely to the recoverable part of orifice flow (deformation flow) than to the non-recoverable (plastic) flow. The horizontal lines in Figure 4 were all obtained while the chart was stopped; those before the time of load removal represent continued flow, and those after load removal represent recovery of the material back through the orifice.

The $M_f$ value is found by dividing the instantaneous deflection into a constant, 845, which is a constant of the CEPAR apparatus and equals the number of chart units per inch deflection of the load plunger.

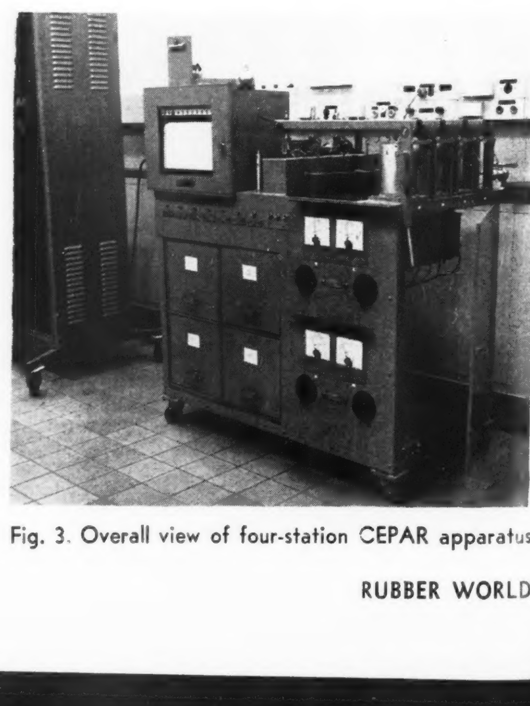


Fig. 3. Overall view of four-station CEPAR apparatus

For the data in Figure 4, the instantaneous deflection is given by the length of the horizontal line at the point entitled "load applied." This gives

$$M_f = \frac{845 \text{ chart units/inch}}{(16.4\text{–}12.0) \text{ chart units}} = 192 \text{ inches}^{-1}$$

This is a quantity which is inversely proportional to the near instantaneous "deformation flow" of the sample under conditions of abrupt load application.

The $N_f$, or flow resistance, value is found by determining the slope of the flow curve at a point where it represents a steady state flow, finding the cotangent of this angle, and multiplying it by 11.7, which is the ratio of the number of chart units per inch of plunger deflection to chart speed in units per minute. For the data in Figure 4 the flow curve near 30 seconds' loading time makes an angle of 15.5 degrees with the direction of chart paper travel, making

$$N_f = 11.7 \text{ cot. } 15.5^\circ = 42.2 \text{ min./inch}$$

This is a quantity which is inversely proportional to the "plastic flow" of the sample. In general, $N_f$ increases with increased loading time due to curing processes. Both $N_f$ and $M_f$ decrease markedly with an increase in driving pressure or an increase in orifice diameter. These conditions, then, must be fixed for tests on stocks which are to be compared with each other.

The hot recovery value, R, is found by dividing the recovery in chart units at a specified time after load removal by the total deformation at the time of load removal. For the data in Figure 4 this gives for the hot recovery index measured one minute after load removal:

Recovery in chart units upon load removal = 43.7 − 21.0 = 22.7 chart units

Total deformation at time of load removal = 43.7 − 12.0 = 31.7 chart units

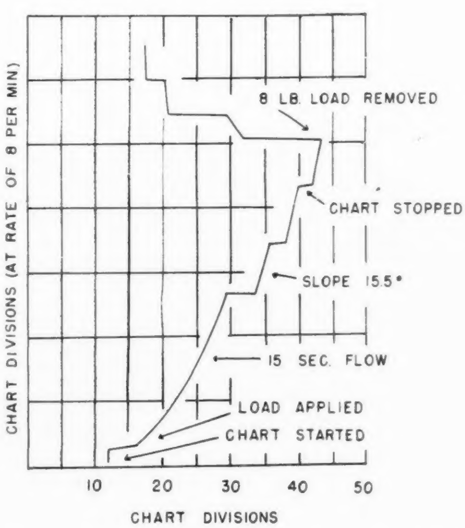



Fig. 4. Typical CEPAR chart for determining $M_f$, $N_f$, and R

F. S. Conant

W. E. Claxton

## The Authors

F. S. Conant, research physicist, Firestone Tire & Rubber Co., received his B.S. from Morris Harvey College in 1934 and his M.S. from West Virginia University in 1935.

Mr. Conant taught physics at the high school in Elizabeth, W. Va., from 1935 until 1942. He joined Firestone in 1942 as a research physicist, a position he has held to date.

He is a member of the American Physical Society, an associate member of the Division of Rubber Chemistry of the American Chemical Society, and a member of Committee D-11 on Rubber of the American Society for Testing Materials.

W. E. Claxton, research physicist, Firestone, received his B.S. from Harvard University in 1948 and his M.S. from the University of Cincinnati in 1950. He joined Firestone in his present position in 1951, and his industrial career to date has been with that company.

Mr. Claxton is also a member of the APS and an associate member of the Rubber Division, ACS.

$$\text{From which R} = \frac{22.7}{31.7} \times 100 = 72\%$$

In a similar manner the recovery could be evaluated for any chosen time after load removal. For many stocks no visible recovery will occur after one minute, whereas others will continue to recover for longer periods. A measure of hot recovery of this nature is believed to be unique among processability tests.

Flow scorch, an increase in resistance to flow due to curing or thermal bonding processes, is found by plotting $N_f$ against heating time. The shape of the curve indicates the scorch behavior of the stock. No specific index for this property has been established, although it has been observed that the heating time represented by the onset of the steep portion of the above curve in general agrees with the scorch time determined by modulus measurements.

Orifice swell is the ratio of extruded diameter to

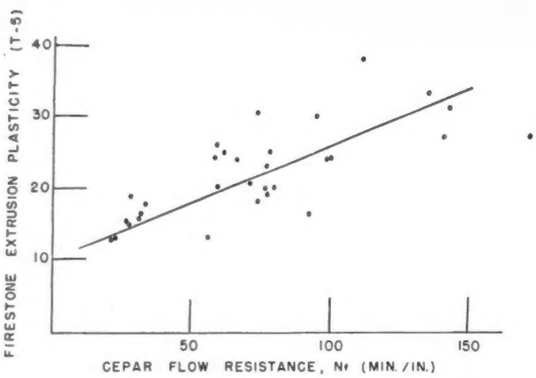



Fig. 5. CEPAR flow resistance vs. Firestone extrusion plasticity index

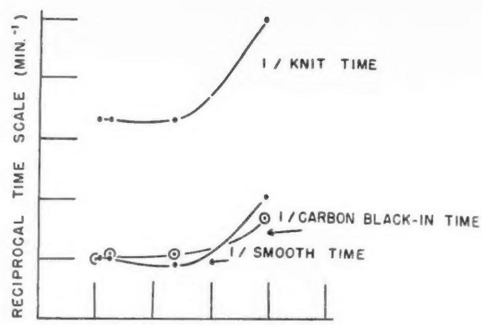



Fig. 6. Composite CEPAR processability index vs. mill handling characteristics of different elastomers. Time scale is in reciprocal minutes

TABLE 1. COMPARISON OF MOONEY,* WILLIAMS,† AND CEPAR PLASTICITY INDICES ON COMPOUNDED COLD SBR STOCKS

| Compound | A | B | C | D | E |
|---|---|---|---|---|---|
| Mooney ML/4/212° F. | 59.0 | 51.0 | 74.5 | 58.0 | 56.5 |
| Williams $Y_3$ @ 212° F. (mm.) | 4.68 | 4.30 | 5.60 | 4.40 | 4.56 |
| Recovery (mm.) | 1.16 | 0.78 | 2.22 | 0.91 | 0.90 |
| Increase (%) | 24.8 | 18.2 | 39.7 | 20.7 | 19.8 |
| CEPAR @ 260° F. $N_f$ @ 15-sec. (min/inch) | 25 | 18 | 83 | 33 | 27 |
| $M_f$ (inch⁻¹) | 161 | 84 | 307 | 170 | 143 |
| % Recovery | 17 | 8.6 | 59.0 | 21.3 | 20.0 |
| % Swell (maximum) | 24.8 | 26.0 | 19.2 | 24.0 | 22.4 |

CEPAR test conditions: 260° F., ¼-inch diameter orifice, 8-lb. load, 4-g. specimens, recovery for 75% load removal (—6 lb.)

* ASTM D 1646–59T, American Society for Testing Materials, Philadelphia 3, Pa.

† ASTM D 926–56.

orifice diameter and is determined from measurements made on the specimen after it has been removed from the test chamber and cooled. Normally the specimen tip, which extrudes at a relatively low temperature during the initial loading-preheating period, has a larger diameter than does the portion extruded at a constant rate. Both measurements are usually recorded.

## Comparison with Conventional Test Results

When applied to stocks covering a wide range of plasticities, the conventional plasticity tests and the CEPAR test all give results which rate the stocks in the same general order. Considerable differences in relative values are apparent, however, which show that the different tests do not all measure the same property. This is illustrated by the data in Table 1 in which sample C shows the highest Mooney, Williams, $N_f$ and $M_f$ values and recovery indices of the five cold SBR compound samples in the series. Sample B shows the lowest CEPAR recovery and Williams indices. Indices for the other samples, however, give mixed ratings.

A general correlation between $N_f$ and Firestone extrusion plasticity T-5 values[4] is shown by the data in Figure 5 on a group of cold SBR tread-type compounds.

The time required for a polymer to break down on a mill and the manner in which pigments are incorporated are important characteristics of its general processability. Indices which have been developed to represent these properties include "knit time," or the time required for the polymer to form a band on the mill, "smooth time," or the time required for the band to become smooth and free from holes, and "carbon black-in time," or the time required for a given amount of carbon black to be incorporated into the mix.

A composite CEPAR index, $N_f + 1/5\ M_f$, has been found to vary concomitantly with each of these indices, as is shown by the data in Figure 6 for a series of samples representing varying degrees of polymerization of an elastomer in a processing study. This composite index was arrived at by a trial-and-error procedure to determine the best relative weighings of the two indices for correlation with the laboratory mill handling characteristics. The data in Figure 6 show that the samples of the elastomer which required the shortest time to knit together, to band smooth on the mill, and to incorporate carbon black gave the highest values for the composite index; whereas those requiring the longest times for these phenomena gave the smallest values for the index.

## Reproducibility of Results

Reproducibility of the major CEPAR processability indices is generally higher than the reproducibility of different mixes based on a given formula; so they can be used to check the latter.

An illustration of the precision of these indices is given in Table 2 where the data represent results obtained on 10 samples of a single mix of cold SBR tread-type stock. The reported probable errors indicate that 50% of all tests made on this stock would give $N_f$ values within ±3.8% of the mean given, $M_f$ values within ±6.3% of the mean, and R values within

[4] J. H. Dillon, N. Johnston, *Rubber Chem. Tech.*, 7, 248 (1934).

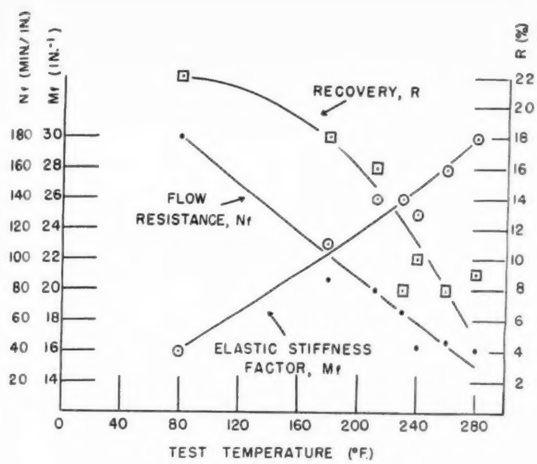



Fig. 7. Effect of test temperature on CEPAR processability indices for cold SBR tire tread-type stock

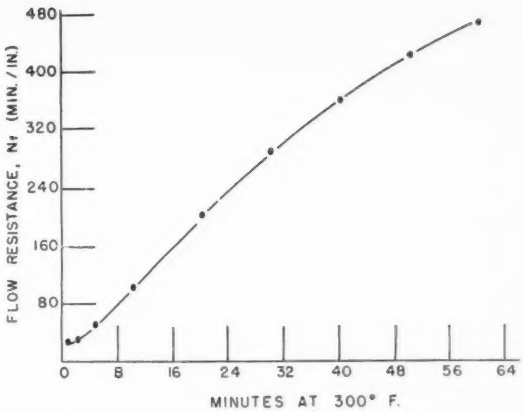



Fig. 8. Increase in CEPAR flow resistance with time at 300° F. for a cold SBR-HAF carbon black masterbatch

TABLE 2. REPRODUCIBILITY OF CEPAR PROCESSABILITY INDICES ON A COLD SBR TREAD-TYPE STOCK*

| Sample No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Ave. | Statistical Prob-Error |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $N_f$ @ ¼-min. | 18.2 | 18.2 | 17.4 | 19.4 | 18.2 | 20.4 | 18.2 | 20.9 | 18.9 | 20.9 | 19.1 | — |
| ½-min. | 19.9 | 19.5 | 18.9 | 21.3 | 20.9 | 22.4 | 19.4 | 20.9 | 20.9 | 25.3 | 20.9 | — |
| ¾-min. | 22.5 | 20.9 | 20.9 | 22.4 | 21.3 | 25.3 | 20.4 | 23.0 | 21.8 | 25.3 | 22.4 | — |
| 1 min. | 22.5 | 22.0 | 21.3 | 23.6 | 22.4 | 25.3 | 22.4 | 23.6 | 23.0 | 25.7 | 23.2 | ± 3.8% |
| 1¼ min. | 24.2 | 25.3 | 23.0 | 25.3 | 25.6 | 25.7 | 25.3 | 25.3 | 23.0 | 27.3 | 25.0 | — |
| 1½ min. | 25.3 | 25.9 | 24.2 | 28.0 | 25.6 | 28.0 | 25.3 | 25.7 | 23.6 | 28.0 | 26.0 | — |
| $M_f$ | — | 122 | 102 | — | 102 | 111 | 101 | 93.5 | 102 | 92.0 | 108 | ± 6.3% |
| $R_{5lb}$† (%) | 12.8 | 12.4 | 15.0 | 12.6 | 13.4 | 15.1 | 13.1 | 15.1 | 12.9 | 16 | 13.8 | ± 6.0% |

Test conditions: 250° F., ¼-inch diameter orifice, 5-g. specimens, 6-lb. load, 5-min. preheat

* 131 parts oil-extended SBR polymer, 65 parts HAF black; sulfur-N-tert.-butyl-2-benzothiazole sulfenamide (Santocure NS, Monsanto Chemical Co.) cure.

† $R_{5lb}$ = percentage of total deflection recovered in 15 seconds after removal of 5-lb. load.

$N_f$ values given in min./inch. $M_f$ values given in inches$^{-1}$.

±6.0% of the mean. No special precautions were used in mixing this stock.

## Effect of Test Temperature on CEPAR Indices

Flow resistance, $N_f$, has always been found to decrease with increasing temperature; however, the recovery, R, and the elastic stiffness factor, $M_f$, may either decrease or increase with increasing test temperature, depending upon the particular compound and the chosen temperature range. An illustration of the temperature dependence of these CEPAR indices is shown in Figure 7 for a cold SBR compound with 131 parts oil-extended polymer, 65 HAF black; sulfur-Santocure NS cure.

## Effect of Heat History on Flow Resistance

It is well known that fully compounded stocks will "scorch," that is, they will acquire physical characteristics similar to those of partly vulcanized stocks, if they are subjected to sufficiently high temperatures during processing prior to curing for a sufficiently long period of time. Furthermore, such a "heat history," acquired during the various processing stages, is additive. For example, a tread stock batch which is kept in the Banbury mixer for longer than its normal cycle is more likely to scorch in the tread extruder, it has been found, than is a batch which is kept on its normal schedule.

An analogous effect, which cannot be attributed to partial vulcanization, may occur in polymer/carbon black masterbatches. This effect is illustrated in Figure 8 for a masterbatch (no curing ingredients) of 100 parts cold SBR and of 50 parts HAF black, which shows a steady increase in $N_f$ with heating time before testing.

No such effect was found for the raw polymer alone; $N_f$ remained practically constant over a 30-minute heating time at 300° F. Evidently the size of the rheological flow unit in the polymer-black masterbatch became progressively larger as the "heat history" was acquired. Such a picture is consistent with the very

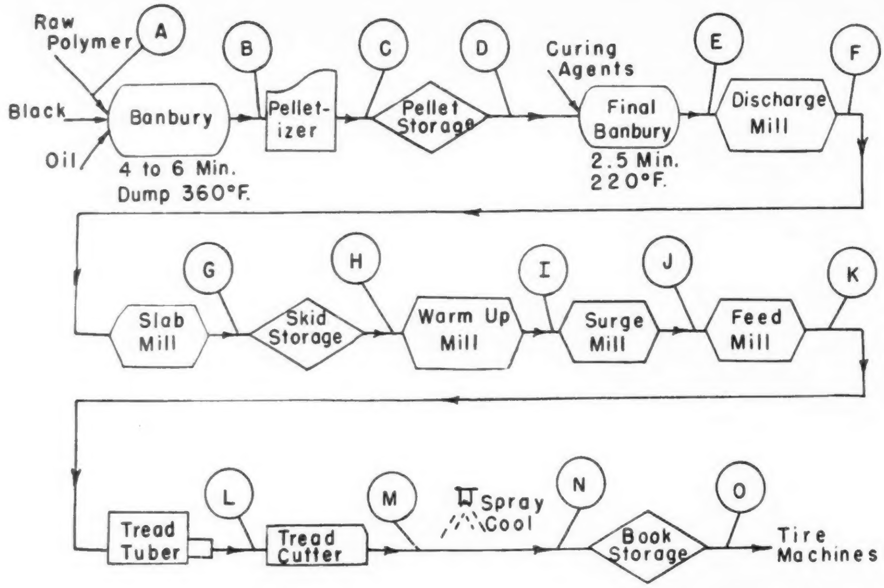



Fig. 9. Factory tire tread processing stages from raw polymer to tire building machines

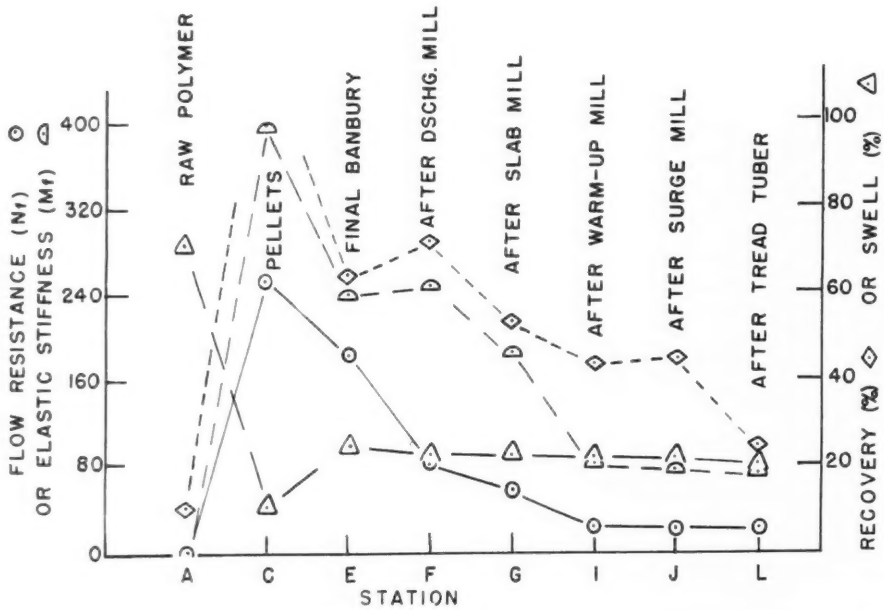



Fig. 10. Variation in CEPAR indices during factory tire tread processing from raw polymer through tread extruder. $M_f$ identified as "modulus factor" here is the "elastic stiffness"

large flow units postulated by Mooney.[5] The "thermal bonds" necessary for an increase in size of the flow unit formed quite rapidly at 300° F., as shown in Figure 8. A subsequent experiment showed that their formation at 280° F., was much slower. After 350 minutes at 280° F., $N_f$ had increased from an initial value of 50 to only 180.

Thermal bonds of the kind shown in Figure 8 did not form at all in compounds containing 50 parts of whiting in place of the black. It was also determined that the thermal bonds formed in the HAF black masterbatch were permanent as regards shelf aging over a period of one month.

Because of the relatively slow rate of formation of these thermal bonds, their effect is masked by the normal curing reaction in fully compounded stocks. Thermal bonds may, however, play an important role in filler stiffening which normally occurs during the first Banbury cycle in factory mixing.

[5] *J. Appl. Phys.* 27, 691 (1956).

Table 3. CEPAR Evaluation of Air Curing High Hardness Compounds

| No. Days between Mixing and Testing | Inches 7-Min. Extrusion—Various Compounds | | | | | |
|---|---|---|---|---|---|---|
| | F | G | H | I | J | K |
| 3 | .38 | .37 | .25 | .29 | .27 | .68 |
| 11 | .28 | .31 | .18 | .26 | .19 | .44 |

CEPAR test conditions: ½ in. diam orifice, 300° F., 5-g. sample, 2-lb load @ ¼ min., + 11 lb. @ 1¼-min. Load removed @ 7 min.

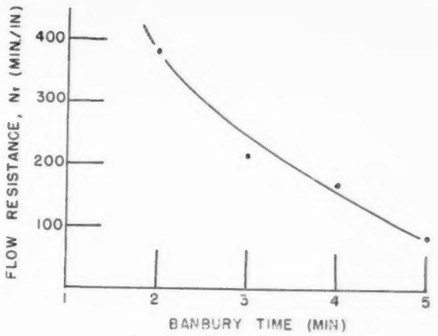



**Fig. 11. Effect of time in the Banbury mixer on the flow resistance of synthetic polyisoprene (Coral rubber)**

## CEPAR Test Applications

A ready application of CEPAR methods to heat history effects is in the study of changes in plastic and elastic properties occurring in a tread stock as it progresses from raw polymer to extruded tread in the factory processing cycle. Figures 9 and 10 show the various processing stages and the progressive change in properties for a cold SBR tread stock. Both the softening effect of mechanical working and the stiffening effect of heat history are evident.

Thus, as is shown in Figure 10, incorporation of the carbon black in the first Banbury mixing drastically reduced the orifice swell from about 75% on the raw polymer (station A) to about 15% on the masterbatch (station C). Processing operations after the final Banbury (station E) had very little effect on orifice swell, which is probably due to the counterbalancing effects of the acquisition of heat history by the compound (tending to reduce swell) and of mechanical breakdown of the polymer (tending to increase swell). In general, the CEPAR flow resistance, elastic stiffness, and hot recovery of the tread compound were affected in a very similiar manner by the various processing stages, as can be seen from the data in Figure 10. The discharge mill (station F), however, has a considerable softening effect on the compound as regards flow resistance, but the elastic stiffness and hot recovery were scarcely altered by this processing operation.

Another example of the use of the CEPAR apparatus is shown in Figure 11, where the results of the progressive breakdown of Coral rubber (Firestone's synthetic polyisoprene) in the size B Banbury mixer are shown. The apparatus was well adapted to this study since the small test sample required made it convenient to take samples from the Banbury at one-minute intervals.

In another compounding study it was required that the stock involved should have a very high durometer hardness and that it should have very little flow while being cured. It was soon established that such a stock was too stiff to evaluate on conventional test equipment. A special test based on the use of the CEPAR apparatus, however, did provide the required data. It was determined that the total length of the stock extruded during a seven-minute period at 300° F. should be not more than 0.40 inch. Some of the compounds evaluated were air-curing, and it was necessary to determine the effect of storage time between mixing and curing.

The data in Table 3 show that compound K was the only one of the six compounds which were evaluated that did not meet the extrusion requirement. Since curing progressed very rapidly as soon as curing temperature was reached, the stocks were in a cured state upon removal from the apparatus at the end of the seven-minute period, most of the extrusion having occurred during the first two or three minutes. The CEPAR apparatus could be used advantageously in this study because ready access to the interior of the heating chamber was possible, and no problem was encountered by the stocks "setting up" or curing during the test.

## Summary and Conclusions

The principal advantages of the CEPAR apparatus over commercially available plastometers for making processability tests include the following: small sample size; rapidity of testing; the wide range of orifice sizes, driving pressures (loads), and temperatures readily available; versatile controls for incremental extrusions at timed intervals (for studying curing effects) and/or for continuous extrusions; and the feasibility of using this apparatus to evaluate flow characteristics of stiff or "boardy" compounds or even of cured compounds normally considered out of range for conventional tests. The apparatus, in its normal application, will yield values for instantaneous orifice deflection (elastic stiffness factor), the continued rate of extrusion, and hot recovery upon load removal. Tests can also be made upon the removed sample for such things as orifice swell, extruded length, etc.

In addition to the applications cited in this paper, the apparatus has been used to study the problem of knitting of factory stocks, as a control instrument to select the best temperature for extrusion processes, and as an evaluation instrument for various compounding studies. It has been used also as an instrument to evaluate the degree of heat softening (up to temperatures of 600° F.) occurring in high-temperature heat-resistant stocks, in studies correlating factory extruded tread center gage with CEPAR swell measurements,

*(Continued on page 83)*

# Manufacturing Developments At Monarch Rubber Co.[1]

**Certain improvements in materials handling, mold handling and product finishing have increased output and reduced manufacturing costs**

By D. C. PRICE
*Monarch Rubber Co., Hartsville, O.*

## The Author

D. C. Price, chief plant engineer, Monarch Rubber Co., attended Kent State University in Ohio from 1947 until 1951 and has continued his studies at Akron University since 1952. He will receive a bachelor's degree in labor relations from Akron University in 1961.

Mr. Price was employed by Hercules Motor Corp. from 1951 until 1957, where he was concerned with engineering design. He joined Monarch Rubber Co. in 1957.

Mr. Price is a member of the Society of Automotive Engineers and the American Society for Quality Control.

MONARCH RUBBER CO., a relatively small company when compared with some of its Akron neighbors, has had an interesting and colorful history since its beginning in a small farming community in Ohio in 1912. Over the years and more particularly in the recent past we have been fortunate in being able to develop many improved and effective manufacturing methods, some of which, we feel, are worth sharing with others in the rubber industry.

## Company History

Before describing some of the more recent developments in manufacturing methods, we believe some information on the activities of the company and types of products manufactured during the last two or three decades will be helpful.

Starting in 1935, Monarch's products consisted largely of pneumatic tires and radiator hose for the automobile industry. With the outbreak of World War II, these products were discontinued, and the company's facilities were devoted to such war production items as rubber-covered bogie wheels for armored tanks, molded-on caster wheels for materials handling equipment, and solid tires for industrial lift trucks.

Following the war, the company had to build a new product line. Using the experience gained through bonding natural and synthetic rubbers to steel on many products previously made for the Armed Forces, Monarch developed a new line of rubber-to-metal products for peacetime use. These products included improved demountable floor-truck tires, automotive weatherstrip moldings, accelerator pedals, body-to-frame insulators, and motor mounts. The postwar product line was also expanded further with floor coverings, sporting goods, roof vent flashing for the construction industry, oil seals for wheel bearings, household appliance parts, and automotive suspension components.

At the present time we are manufacturing more than 500 separate products that vary in size from a 1/8-inch kitchen cabinet door bumper to a 48-inch-diameter solid tire with a 3/8-inch steel rim.

In order to guarantee our customers delivery of products of high quality and good service in emergencies, we have built since 1950 a division devoted exclusively to the production of colored rubber products, a captive tool shop for making our own molds for rubber and plastic products, and a stamping plant for metal inserts.

The number of personnel and facilities devoted to engineering and technical development has been expanded as a matter of management policy. In the laboratory this has resulted in the design of some unusual testing apparatus for checking both established and new rubber products for dynamic mechanical properties, stability, and service life. In the manufacturing area, new techniques are being set up constantly to control the quality of material in process; time and motion studies are made to achieve better production methods; and special-purpose machines are developed to improve and increase production output.

[1]Based on a paper presented before the Akron Rubber Group, Akron, O., Jan. 29, 1960.

## A Scrap-Metal Handling Problem

With a product line of about 500 separate items of many different sizes, weights, and shapes, we use materials handling equipment that ranges in size from a tote pan the size of a cigar box to a 25-ton bridge crane. In general, there is considerable difficulty in providing any large degree of standardization of this type of equipment under such conditions.

One of our more serious material handling problems developed recently in the metal stamping plant when the demand for bonded rubber-to-metal motor mounts increased. As the production of metal parts increased,

**Fig. 1. Unloading metal scrap from bottom-opening dump box by means of mechanical mast attachment on lift truck**

so did the production of steel scrap until we were generating about 20,000 pounds per eight hour shift, and it became obvious that an improved handling method might be necessary.

Certain basic considerations had to be taken into account in connection with the solution of this problem: (1) The container or box had to be adaptable for handling most of the finished metal parts as well as the scrap. (2) The loaded container had to weigh less than 6,000 pounds gross. (3) The container had to be relatively inexpensive and low in maintenance cost. (4) Any attachments for the lift trucks could not interfere with the use of the trucks for other purposes throughout the plant. (5) Amortization time of any new equipment had to be short, that is, a matter of weeks or a few months at the maximum.

Steel scrap from the stamping presses was being deposited in tote boxes, which, when filled, were picked up by lift trucks and moved to a scrap dealer's truck body

**Fig. 2. Close-up of mechanical mast attachment on lift truck**

TABLE 1. COMPARISON OF COSTS FOR HANDLING SKELETON SCRAP AT METAL STAMPING PLANT—OLD AND NEW METHODS

| | |
|---|---|
| Scrap per 8-hr. shift | 19,358 lbs. or one 336 cu. ft. truck load |
| Capacity of load boxes | 20 cu. ft. |
| Loads per shift | $\frac{336}{20} = 16.8$ |
| Min. to handle load box, old method | 13.65 |
| New method | 3.65 |
| Labor costs per min. | $\frac{\$2.00 \text{ direct} + \$0.70 \text{ indirect}}{60} = \$0.045$ |
| Per shift, old method | $13.65 \times \$0.045 \times 16.8 = \$10.31$ |
| New method | $3.65 \times \$0.045 \times 16.8 = 2.75$ |
| Labor saving per shift | \$ 7.56 |
| New equipment and other costs, new method | |
| 20 Work-O-Matic boxes @ \$74.30 each | \$1486 |
| Mechanically operated mast attachment | 110 |
| Fill, drain & grade ramps to rear dock | 330 |
| | \$1926 |

Amortization time

$$\frac{\text{New equipment and other costs}}{\text{Labor saving per shift}} =$$

No. shifts $\frac{\$1926}{\$7.56} = 254.7$ shifts

$$\frac{\text{Total shifts}}{\text{Shifts/week}} =$$

Amortization time in weeks $\frac{254.7}{15} = 16.9$ wks.

outside the building. In order to dump the scrap into the truck from the boxes, however, an overhead crane and operator were necessary to lift the boxes from the lift truck, dump, and then pick up the empty boxes and place them on the lift truck for returning them to storage for future use.

A complete analysis of this steel-scrap handling method was made which entailed making flow charts and elemental time studies. It appeared from a study of these data that the best solution to the problem would be an improvement on the existing method. The new method would require the purchase of a $900 hydraulic mast attachment for a lift truck and the use of standard bottom-opening dump boxes with slight alterations. It was not practical to spend $900 for the hydraulic mast

Fig. 3. Motor mount inserts being unloaded from automatic grit-blasting machine to dump box

attachment, and after many attempts we were eventually able to develop a hand-operated mechanical mast attachment at a cost of $110 complete. (This attachment now sells on the market for $48.)

With the cooperation of a materials handling equipment manufacturer in our area of Ohio, a standard bottom-opening dump box (Work-O-Matic[2]) was altered by welding two six-inch-long "V"-shaped lugs on the back of the box so that our hand-operated mechanical mast attachment would engage for dumping.

Figure 1 shows the bottom-opening dump box after unloading its contents into the scrap dealer's truck. Figure 2 is a close-up of the mechanical mast attachment used for raising the box for dumping.

This new scrap metal handling method was successful beyond our expectations. The savings in labor costs between the old and the new methods were sufficient to pay for the new equipment and other costs within about four months, as indicated in Table 1.

In addition, this same type of box is finding use not only in motor mount processing, as shown in Figure 3, but in many other operations where materials have to be moved in large quantities. Almost daily someone in

[2]Union Metal Mfg. Co., Canton 5, O.

Fig. 4. Dump box on Work-O-Matic stand provides for easy handling during spot facing operation on motor mounts

our organization is finding a new use for the bottom-opening-type dump box. At present we move material between divisions in them; we use them as much as methods will permit on all secondary operations with a positioning stand so that parts are delivered to an operator at an efficient work level (Figure 4); and loan them to our raw material suppliers so as to standardize on incoming containers.

## Shuttle-Car Mold Unloading

In 1959 our company was called upon to make a daily delivery of 7,200 parts of a bonded rubber-to-metal type, which was a higher output for a single part than we had ever been called upon to produce previously. This job involved the use of 12 presses with one mold for each press. For competitive reasons it was

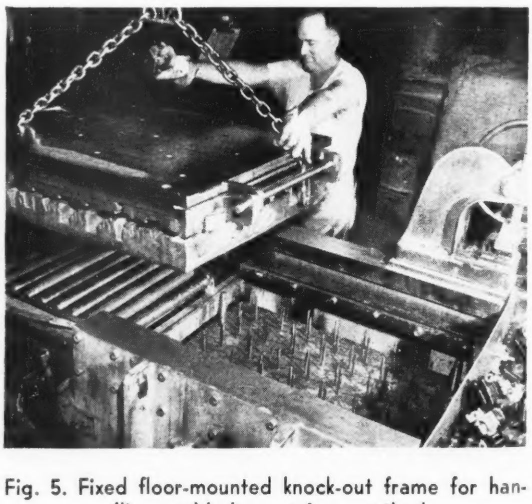


Fig. 5. Fixed floor-mounted knock-out frame for handling molds by previous method

necessary that the molding and curing be done by four men per eight-hour shift, that is, two men for each six-mold press. With previous jobs of this type, the two-man team had been required to handle the output from only three mold presses with the use of one fixed floor-mounted knock-out frame and an electric chain hoist. (See Figure 5.) If Monarch Rubber was to make a profit on this 7,200-parts-per-day job, the same two-man teams would have to handle six-mold presses per shift, which with the existing equipment did not seem possible or practical.

TABLE 2. COMPARATIVE COSTS FOR UNLOADING MOLDS— MOTOR MOUNT CURING

| | |
|---|---|
| Old Method (Fixed Floor Knock-out) | |
| Cost of labor* (8 men) to operate (12) mold presses for 540 eight-hour shifts or nine months. | |
| 64-hr./shift @ \$2.70 = \$172.80 Labor (Established) | |
| Total Labor | \$ 93,312.00 |
| Cost of New Equipment: | |
| (4) Knock-out frames installed and operating | 8,300.00 |
| Total Labor and Equipment | \$101,612.00 |
| New Shuttle-Car Method | |
| Cost of labor (4 men) to operate (12) mold presses for 540 eight-hour shifts or nine months. | |
| 32-hr./shift @ \$2.70 = \$86.40 Labor (Estimated) | |
| Total Labor | \$ 46,656.00 |
| Cost of New Equipment: | |
| (2) Design and build shuttle cars | \$ 12,639.16 |
| Total New Equipment and Labor | \$ 59,295.16 |

Summary:

| | | |
|---|---|---|
| Cost of old method | \$101,612.00 | |
| Less salvage of equipment | 7,700.00 | |
| | \$ 93,912.00 | |
| Cost of new method | \$ 59,295.16 | |
| Less salvage of equipment | 11,389.16 | |
| | \$ 47,906.00 | |
| Estimated Savings of New Method | | \$46,006.00 |

*Labor rates shown in this study are not actual, but chosen for purposes of illustration.

The problem was solved by designing and building self-contained, hydraulically actuated knock-out frame or shuttle cars to operate on a track along the press line to receive each mold and eject the parts from their cavities. (See Figure 6.) With this new equipment the two-man teams were now able to handle the output of six instead of only three mold presses per shift.

The three-plate transfer mold used for this job is shown in Figure 7. One of the major difficulties in the design of the shuttle cars was the necessity of separating the injection plunger plate from the transfer pot of the mold before the finished parts could be ejected when the mold was placed on the knock-out frame. This part

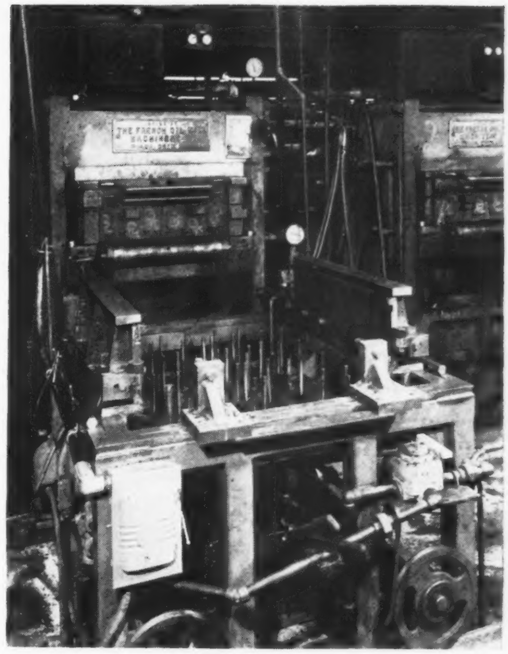


Fig. 6. Self-contained, mobile knock-out frame (shuttle car) for handling molds by new method

of the problem was solved by installing step pins inside the mold itself that would line up with leader pins on the bed plate of the knockout frame, as shown in Figure 8. By mechanically timing the operation, each plate was separated and removed before the molded parts were ejected. (See Figure 9.)

Fig. 7. Loading three-plate transfer plate on shuttle car

Fig. 8. Separating injection plunger plate from transfer mold by means of shuttle car and step pins which are in the transfer mold itself

A spring-loaded plunger-type interlock was installed on each mold press for positioning and operator safety. Power to operate the shuttle car comes off the same trolley duct that formerly operated the chain hoists.

A comparison of the costs for unloading the molds by the shuttle-car method with those by the previous fixed floor-mounted knock-out frame method is given in Table 2. This improvement in the operating costs for this part of the job made it possible for the company to handle the job on a profitable basis.

Fig. 9. Mold on shuttle car with injection plunger plate and cover removed and ready to eject finished parts

## Special-Purpose Machines

As new products are developed and manufacture begins, new and difficult production problems arise. We find this situation especially true in connection with our finishing and inspection operations. In many instances when a production bottleneck develops in some phase of our manufacturing process and there is no equipment commercially available to take care of our requirements, we have to design and build the machine that will get the production flowing smoothly again.

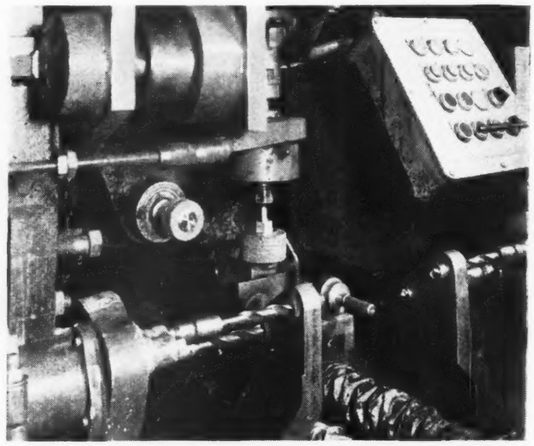


Fig. 10. Close-up of three-station, six-operation automatic buffing machine which removes flash from four inside surfaces and reams four bolt holes of motor mount

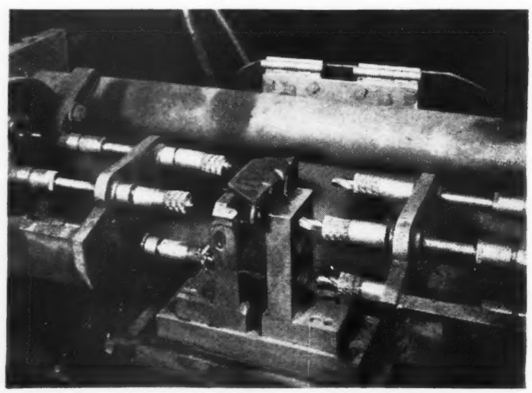


Fig. 11. Close-up of one station of machine where three-bolt holes are spot faced on both sides

In 1959 we found it necessary to design and build two fast cycling automatic buffing machines for removing the excessive flash from the contact surfaces on automotive motor mounts. One of these machines, which was required as part of the same job for which the shuttle car was built, was a three-station, six-opera-

tion automatic buffer complete with memory circuit. This machine removed flash from four inside surfaces of a part and reamed four bolt holes and is shown in Figure 10.

The other machine was designed for a completely different part and sizes and spot faces three bolt holes on two sides of the part; while in another station on the same unit the outside mounting flanges are cleaned. A close-up of the spot facing station is shown in Figure 11.

Both of these machines were designed so that the holding fixtures doubled as inspection gages so that the customer was actually getting 100% inspection on the parts finished on these machines.

## Summary and Conclusions

Improvements in manufacturing techniques are particularly important in these days of intense competition for a rubber goods company dealing extensively with customers in the automotive industry. Such improvements are of especial value in the fields of materials handling and finishing and inspection, and Monarch Rubber has been fortunate in its achievements in these fields.

A study of the handling of 20,000 pounds of metal scrap per eight-hour shift in our metal stamping plant revealed that by means of the use of standard bottom-opening dump boxes and an inexpensive mechanical mast attachment on a lift truck, the labor costs for handling this metal scrap could be reduced to approximately one-quarter of the existing figure. This saving made possible the amortization of the cost of new equipment in slightly more than four months. In addition, the new bottom-opening dump boxes were found to be advantageous in many other ways for handling other material in process and for providing a standard container for receiving materials from suppliers.

When confronted with the problem of doubling the output of molding and curing presses in motor mount production, the development of self-contained, mobile knock-out frames or shuttle cars for handling three-plate transfer molds enabled our company to compete successfully on an order for an unprecedented number of parts per day. The two-man team that had previously been required to handle the output of three mold presses was able now to take care of six of these presses.

The design of special machines for removing flash and reaming out bolt holes in motor mounts has enabled us to increase output in this area of manufacturing and, in addition, has provided for automatic inspection of the parts for proper dimensions.

Such success as we have had in improving our manufacturing methods has been based to a large degree upon building cooperative work efforts in our organization. Employes are encouraged to participate as much as possible in decisions affecting their jobs in order to integrate everyone into an efficient working team.

# ASTM Defines "Rubber" and "Rubber Products"

A new definition for rubber, which should be of much help not only to technologists, but to the rubber industry worldwide, has just been approved on a tentative basis by the American Society for Testing Materials, Philadelphia, Pa., and is given below. This new definition is the result of more than two years' work by ASTM Committee D-11 on Rubber and Rubber-Like Materials. There will be continued study by the Committee to improve further this definition, but it is now available under the designation ASTM D 1566-60T. A tentative definition for rubber products has also been approved and is included under the same designation as the definition for rubber.

"Rubber is an elastomeric material that can be or already is modified to a state exhibiting little plastic flow and quick and nearly complete recovery from an extending force. Such material before modification is called, in most instances, a raw or crude rubber and by appropriate processes may be converted into a finished product.

"When rubber is converted (without the addition of plasticizers or other diluents) by appropriate means to an essentially non-plastic state, it must meet the following requirements when tested at room temperature (60-90° F.; 15-32° C.).

"A. Is capable of being stretched 100%.

"B. After being stretched 100%, held for 5 minutes and then released, it is capable of retracting to within 10% of its original length within 5 minutes after release (ASTM D 412-51T)."

■

## CEPAR Apparatus

*(Continued from page 77)*

and in tests for degree of polymerization in SBR produced by the continuous process.

### Acknowledgments

A great many members of Firestone research organizations contributed toward the development and evaluation of the CEPAR apparatus in demonstrating its range of application. In this connection we especially want to thank Sydney Smith and the Firestone research laboratory physical testing group. The continued interest and encouragement of F. W. Stavely and J. W. Liska are especially acknowledged. The permission of the Firestone Tire & Rubber Co. to publish the work is also greatly appreciated.

# Revolving Drum Tests Tread Wear

## Laboratory results correlate well with tire abrasion in outdoor road testing

THE National Bureau of Standards has developed a new laboratory method for measuring the rate of tire tread wear. The method, for the most part, produces results close to those obtained in road testing, the Bureau reports.

In this method the tires are held against the inner surface of a cylindrical roadway that revolves at a selected speed. Tests are run to duplicate outdoor test runs of 500 miles or more at speeds of up to 65 miles an hour.

The tread wear test, developed for the Army Ordnance Tank Automotive Command, is described in a study made by G. G. Richey, J. Mandel, and R. D. Stiehler, of the NBS staff.

The advantage of such a test over a road test, the Bureau researchers explained, is that the variables present in road testing, such as speed, load, temperature, inflation pressure, and slip angles, can be controlled in the laboratory. Slip angles are produced under road service conditions of steering, when the tires on a vehicle are turned to follow a curved path.

By controlling the variables, reproducible data could be obtained for comparing rates of tread wear of different tires.

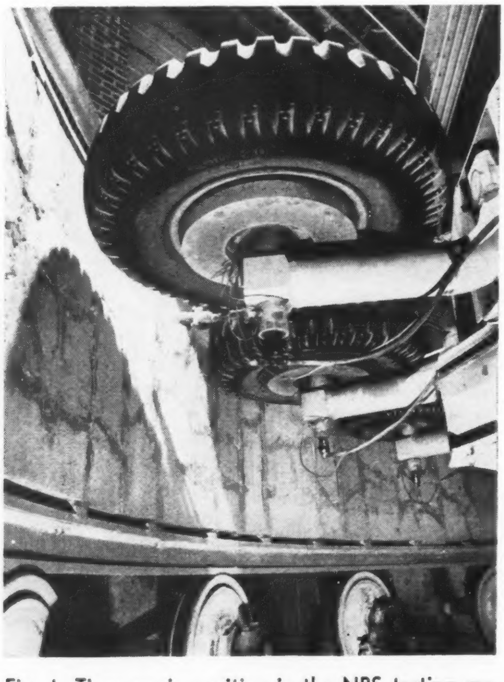


Fig. 1. Tires are in position in the NBS testing machine, ready to be forced outward against the concrete-lined vertical roadway for a test run

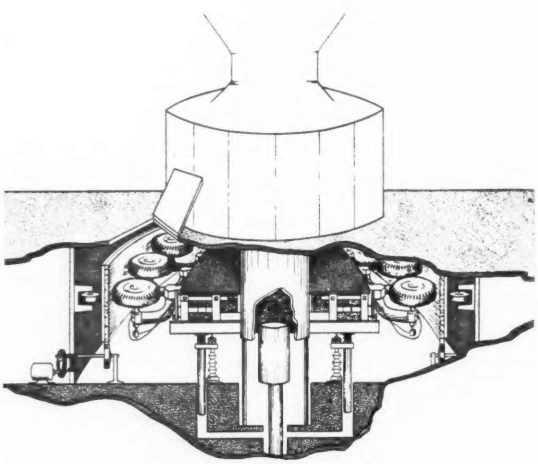


Fig. 2. Cut-away section of the indoor roadway. The carriage in the center can raise or lower tires on the roadway and increase or decrease load on the tires

The main defect in the test, the researchers reveal, is that it tends to show a lower rate of tread wear for treads with a low coefficient of friction than is actually borne out in road tests. Study is going on to correct this defect in testing procedure.

Study results showed that the rate of wear on the indoor roadway was greater than in an outdoor test, perhaps because of the roughness of the roadway or with accentuated wear on the trailing edges of the tread elements because of the curvature of the roadway.

The ratio of wear, however, of two different types of tires was quite similar in the indoor and outdoor tests. Analysis of results did not show any relation between severity of tests and relative rate of wear of the tire treads, the researchers indicate.

### Equipment Details

The major feature of the test equipment is the roadway, a steel cylinder 28 feet in diameter and 3½ feet high, lined with three-inch concrete. (See Figures 1 and 2.) This cylinder is in a vertical position, supported by streetcar wheels machined to close tolerances. Twelve 20-hp. motors can vary the speed of the roadway up to 65 miles an hour.

Tires are mounted horizontally around the inside of the roadway on carriages that extend out from a central platform. Because of the independent control of the various measuring devices for each tire and carriage assembly, tires ranging in size from 6.70-15 passenger car to 11.00-20 truck tires, at different loads

and inflation pressures, may be included in a single run.

The air-spring assemblies that apply the load are mounted on the central platform, which may be mechanically raised and lowered to permit the tires to traverse the roadway. When load is applied, the carriages move radially to force the tire treads against the concrete surface of the roadway.

An eccentric, connected to the cantilever arm of each carriage assembly and rotated automatically at a speed of one revolution per minute during a test, varies the slip angle in such a way that positive and negative slip angles of equal magnitude are obtained during each cycle. The eccentrics were set to produce maximum slip angles of 0, 13, 28, 49, 58, and 73 minutes of arc in the study reported by Richey, Mandel and Stiehler.

The temperature of the air in the tires is measured by a method in which copper-constantan thermocouples are inserted in the tire valve stems.

An air hose connected to each valve stem through a rotary joint permits measurement and adjustment of inflation pressure during a test. A pneumatic switch in the air line causes retraction of the tire if the inflation pressure falls below a set value.

Tread wear was measured by weighing the tire, to the nearest gram, before and after the test run.

## Road and Indoor Tests

Two brands of 7.00-16 six-ply military tires having cross-country non-directional treads were tested by road testing as well as on the indoor tester. During one half of each test period the two tires on each axle were of the same brand, and during the other half, one tire of each brand was put on each axle. Tires were inflated to 25 psi., and the load was 1,230 pounds.

Fig. 3. C. O. Shoemaker, of the National Bureau of Standards, prepares a tire for tread-wear testing. Tires and equipment are housed in a separate chamber maintained at constant temperature

Fig. 4. G. G. Richey, of the National Bureau of Standards, weighs a tire before testing. After it has been run over the indoor roadway for 500 miles it will be tested again

The result showed a mean wear of about 100 grams per 1,000 miles, and a rate of tread wear for Brand J 1.27 and 1.14 times faster than for Brand H, during the outdoor tests.

In the lab, tests were made with maximum slip angles of 0 and 30 minutes. At the 0 angle, tires were tested at 1,230 pounds, and at the 30-minute angle at 1,230 and 710 pounds. At 0 angle of slip and 1,230 pounds of load, tread wear was 155 and 191 grams, two times as severe as the outdoor test. At 30 minutes, tread wear was 260 grams under 1,230 pounds' load, and 137 grams under 710 pounds' load.

Relative rate of wear was 1.55 times as high for Brand J as Brand H in the first test, 1.35 times as high in the second, 1.20 in the third, and 1.00 in the fourth. This was an average of slightly more than 1.25 times as high, about the same as in the outdoor test.

## Wax Effect Evaluated

In order to test treads having quite different slip coefficients, special 6.70-15 four-ply passenger tires were obtained from The B. F. Goodrich Co. Half of the tires were regular, and the other half had treads containing 15 parts of paraffin per hundred of natural rubber, lowering their coefficient of friction.

(*Continued on page 87*)

# Adamson United To Make Intermix

**Manufacturer says Intermix offers improved dispersion, less waste, shorter mixing cycle, and low cost of upkeep with many of the advantages of open mill mixing**

ADAMSON UNITED CO., Akron, O., recently was licensed to manufacture a new type of internal mixer with many advantages of mill mixing, the Shaw Intermix, in the United States. It will be manufactured and sold here under the name, Adamson-Shaw Intermix.

The mixer was originally developed by Francis Shaw & Co., Ltd., Manchester, England, in 1932. Today 150 Intermix internal mixers of various sizes are in use in both large and small plants making many diverse parts in many parts of the world.

The manufacturer claims these advantages for the Intermix:

- Improved dispersion.
- Lower maintenance costs.
- Shorter mixing cycle.
- Ability to mix difficult stocks.
- Rapid loading.
- Mixing of low-temperature stocks.
- Better temperature control.
- Less leakage waste.

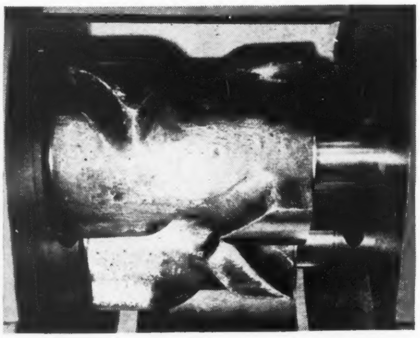
According to John Drew and R. W. Cox, of Adamson United, the Intermix is designed to knead the material rather than smear it against the walls of the mixing chamber, as do other internal mixers. It operates on much the same principle as a mixing mill, enabling it to handle some stocks previously only miscible by mill.

## Mixing Principle

The Intermix consists of two rotors, one of somewhat larger diameter than the other, with interlocking nogs, or projections. The rotors make the same number of turns per minute, since their nogs must intermesh. However any nog on the circumference of the larger rotor must travel a greater distance than the corresponding one on the smaller rotor in order to complete one full turn. In order to cover a greater distance in the same amount of time it must move at greater speed. The difference in speed between the two nogs creates a kneading action as they pass one another.

Materials in a batch are loaded through a chute at the top of the Intermix. The ram, or pressure plate, in the throat of the chute, extending the full width of the rotors and from center to center of the rotors, is lowered to maintain a constant yielding pressure against the batch. The ram exerts the same action through the full area of the mixing chamber, forcing the batch between the bite of the rotors.

When the mixing cycle is completed, a sliding gate at the bottom of the Intermix, also extending the full width and from center to center of the rotors, slides to one side to drop the batch on to a mill or slabbing extruder.



Interlocking rotors on the Intermix knead rubber between them, rather than smearing it against the walls of the chamber as in other internal mixers

## Mixing Temperature Controlled

The rotors and nogs, as well as the chamber bodies, ends, gate, and ram, are cored for steam heating or water cooling, making possible more precise control of mixing temperatures and effective cooling of stocks requiring low-temperature mixing.

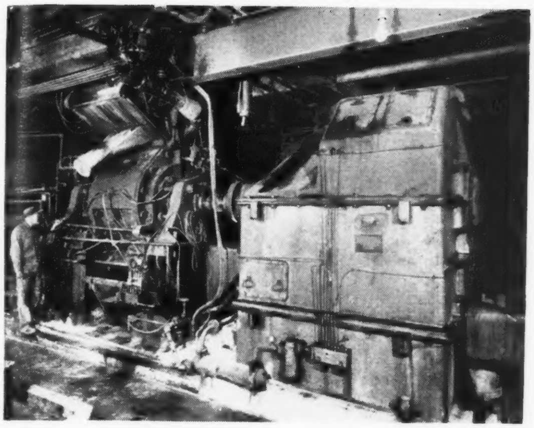
The rotors are cast from a chrome, nickel, molybdenum alloy steel for maximum toughness and wear resistance, welded to a high tensile forging shaft for maximum resistance to bending and torque. They are highly wear resistant.

The rotors run in anti-friction, heavy-duty roller bearings that are sealed completely and are cooled and lubricated by a forced flood circulating oil system. Since the bearing housings are separated from the end frames of the machine, they are not affected by the temperature of the main chamber, contributing to longer life.

## Wear Reduced

Since the batch is kneaded between the rotors, wear on the mixing chamber of the machine is at a minimum. For very abrasive applications, hard-surfaced liners can be substituted for the usually furnished materials in the main housing liners.

The anti-friction roller bearings permit holding the rotors against both axial and radial movement, eliminating side thrust against the end plates. Split Meehanite wear plates, however, are inserted in the chamber



**Workman at B. F. Goodrich Co. plant, Akron, O., tends K-7 Intermix, at left. At right is the pinion-stand drive of the mixer**

ends and can easily be replaced without altering the rotor settings or removing the mixer body.

The main body of the machine, of cast Meehanite, is jacketed and is made in two sections to permit removal after unbolting from the side plates. This construction permits the rotors to be built up with hard weld on the machine when and if wear or damage should make this necessary.

The dust seals are packing glands, split for easy removal, consisting of a spreader ring, a "U" packing ring, and square sections of metallic packing. Grease or process oil is supplied to the seal assembly right behind the packing ring to provide lubrication and added sealing qualities. If the seal is removed and cleaned every 500 hours of operation, the manufacturer says, leakage through the seal is virtually eliminated.

## Leakage Minimized

In addition, the wear plates have a mating, circumferential groove for a tongue machined on the rotor to reduce the pressure of any mix forced into the area during the mixing cycle and thus minimize the amount of stock reaching the dust seals.

The sliding gate for discharge of the batch is operated hydraulically. On the K-6 and K-7 models, the two largest, air-operated gates are also available. The gate, made from cast carbon-manganese steel, runs on a cast-iron slide with replaceable wear strips. Extensions on the gate keep the slide covered at all times to prevent material from falling on them and to prevent contamination of the mix by accidental inclusion of the slide lubricant.

For extremely critical applications, where large quantities of fine powders are involved, a wedging action can be built into the gate-operating mechanism to provide an even tighter seal of the gate.

The ram in the throat of the loading chute is moved up and down by an air cylinder for operation on 80 to 100 pounds' standard plant air supply.

## Seven Sizes Available

The Adamson-Shaw Intermix is available in seven sizes, from the K-0, weighing 2,500 pounds without motor and having a chamber capacity of 60 cubic inches or 0.26-gallon, to the K-7, with a weight of 140,000 to 152,000 pounds and a chamber capacity of 16,213 cubic inches or 70.26 gallons.

Normal rotor speeds for any size Intermix are 22, 33, or 44 revolutions per minute. Horsepower runs from 5 to 10 for the K-0 to 250 to 1,000 for the K-7. Motor speeds are 1,150 for 22 or 44 rpm. rotor speeds, and 870 for 33 rpm. rotor speeds.

Intermix machines can be furnished as a complete package, less drive motor.

According to the company, The B. F. Goodrich Co. made a K-7 Intermix available to each of its different divisions over a period of more than two years to test the mixer. This test Intermix is now being ultilized in regular production at Goodrich's Industrial Products Division.

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# Revolving Drum

*(Continued from page 85)*

The tires were inflated to 24 psi. with a load of between 1,060 and 1,070 pounds and run 500 miles at a maximum speed of 50 miles an hour in both the indoor and outdoor tests. Half the time the tires with paraffin treads were tested together on one axle, and those without paraffin on the other. The other half of the time a tire with paraffin and one without were paired on each axle.

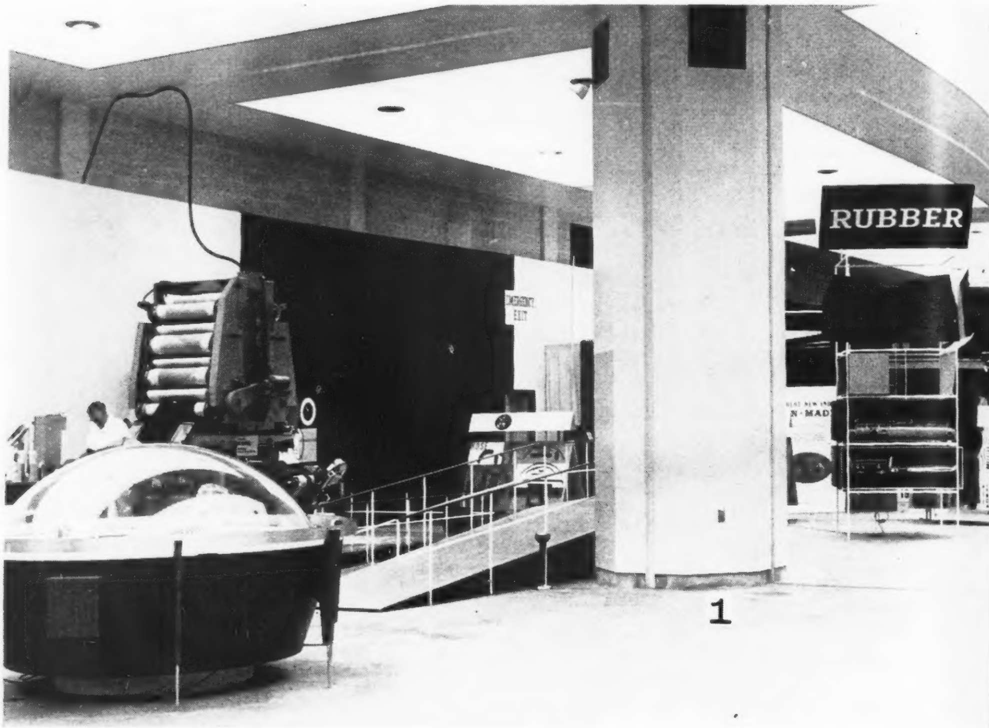
The result in the outdoor test was that the paraffin tires wore down 1.75 and 1.38 times as fast as those without paraffin when tires without paraffin were paired on one axle, and tires with paraffin on another. When there was one of either kind on each axle, no difference was noted.

The indoor tests were made with maximum slip angles of 0 and 30 minutes. They showed the reverse of the outdoor tests, with the paraffin tires showing less wear than those without paraffin, 0.76 and 0.69 times as much wear.

## Conclusions

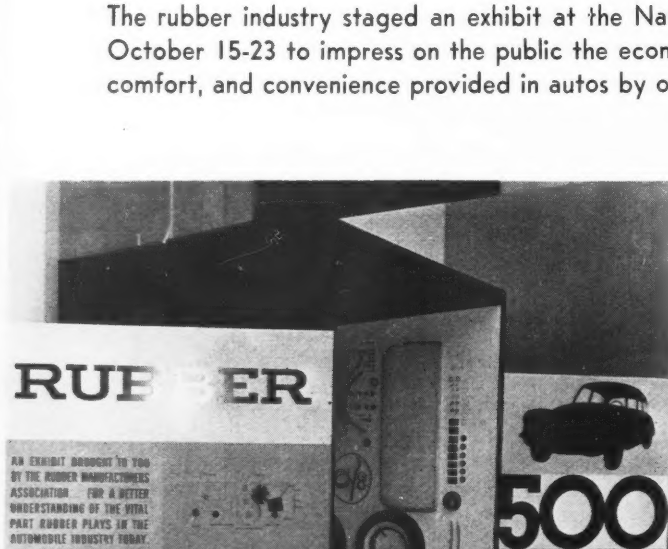
The research team concluded that the tires with a low coefficient of friction would slip more in actual service than cars with a high coefficient of friction. Therefore using a constant angle of slip for both high friction and low friction tires tends to indicate less wear for low friction tires than is actually the case, and more wear for high friction tires than is actually the case.

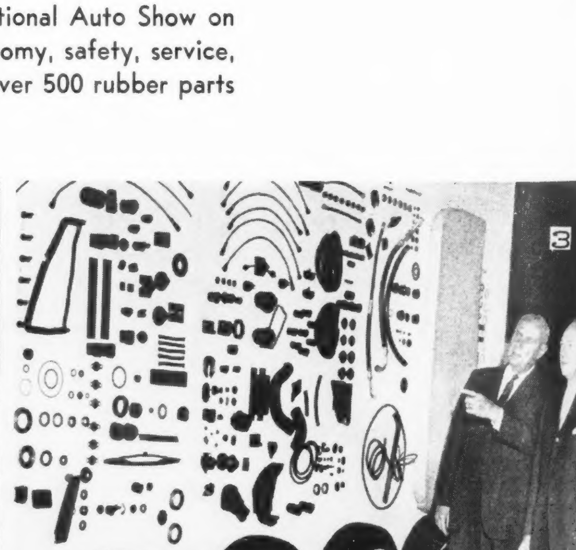
The researchers also reported that, except for small angles, the tire treadwear increases exponentially with slip angle.




# Rubber Parts Exhibit at Auto Show

The rubber industry staged an exhibit at the National Auto Show on October 15-23 to impress on the public the economy, safety, service, comfort, and convenience provided in autos by over 500 rubber parts

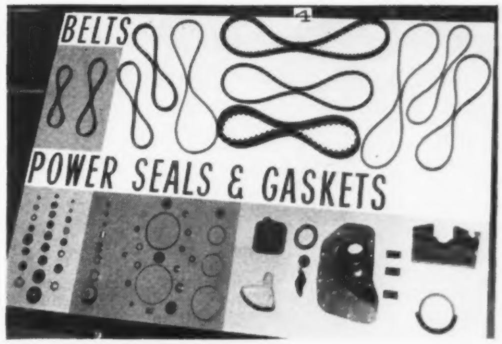


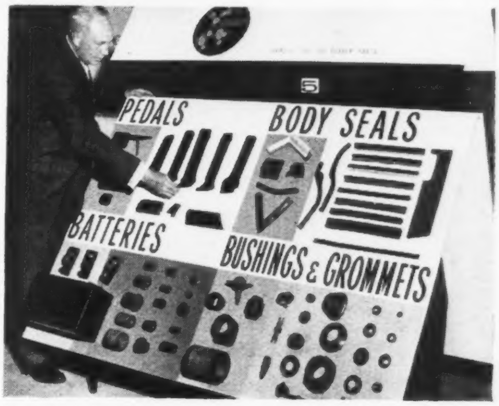



The rubber industry was well represented at the forty-third National Automobile Show with an exhibit on automotive rubber uses as part of the "Auto Wonderland" presentation. This part of the Show gave the visitor a continuous look into how a new model of a car comes into being and the role played by various materials in parts for the final production auto. The tour started with the artists' designs, worked through the clay mock-ups, and concluded with displays on the uses of steel, glass, aluminum, plastics, and rubber, with exhibits of specific sub-assemblies also included.

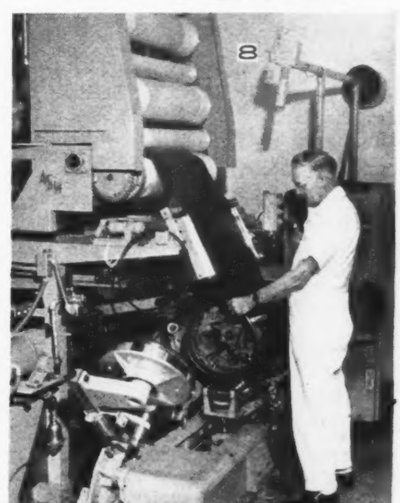
This Auto Wonderland was located on the river level of Detroit's new exposition center—Cobo Hall. The immense main floor of Cobo Hall contained displays of almost all U. S. offerings of 1961 model trucks and cars.

The rubber exhibit (a partial view of the area is shown in Figure 1.) was designed to hammer home to the public the importance of more than 500 automotive rubber parts to their motoring economy, safety, service, comfort, and convenience. The entrance to the area, as seen in Figure 2, admitted the viewer to the planned series of static and operating displays showing the parts and some aspects of their manufacture. The publicity committee of The Rubber Manufacturers Association, Inc., produced the exhibition with the cooperation of the entire industry. RMA Secretary George Flint and President Ross Ormsby examine, in Figure 3, a panel showing many of the 500 parts in a general display. Certain product groups were also shown with, in Figure 4, many typical belts, power seals, and gaskets featured on one "A" panel; pedals and related parts, are examined by Mr. Ormsby in Figure 5; and hose on still another panel, as pointed out by Mr. Flint and the RMA public relations director, C. C. Miller, in Figure 6. Several pictorial panels were included, such as the one on man-made rubber in Figure 7. Finally, the building and curing of tires was carried out on small scale. The tire building machine is shown in Figure 8.





# meetings and reports

On-the-Spot Report from "Rubber World" Editor R. G. Seaman

# Berlin DKG Congress Offers 62 Papers; 1,000 from 25 Countries Participate

Presentation of the Carl Dietrich Harries plaque to Paul Baumann, *left*, and H. Holzrichter, Farbenfabriken Bayer AG, by G. Fromandi, president of the German Rubber Society

WEST BERLIN, October 8. The 1960 Congress of the Deutsche Kautschuk-Gesellschaft, DKG, or German Rubber Society, which ended here yesterday, was highlighted by two special lectures, one on developments in synthetic rubber, and the other on developments in synthetic fibers; the presentation of the Carl-Dietrich-Harries Plaque to two members of the DKG; an address by Burgomaster Franz Amrehn of the City of West Berlin; and the attendance of more than 1,000 delegates from 25 countries. Forty per cent of the delegates were from outside West Germany, including about 50 from the United States.

The meeting was held in the beautiful Congress Hall, located in West Berlin's Tiergarten, or city park, and an exhibition of rubber processing and testing machines was a part of the Congress. A special exhibition on trends in the use of synthetic fibers in the rubber and related industries was included.

On the evening of Tuesday, October 4, prior to the beginning of the Congress symposia the following morning, the Senate of the City of West Berlin gave a reception for the guests of honor in The Schoneberg City Hall, the seat of the West Berlin Senate and City Parliament. In the absence of Berlin's mayor, Willy Brandt, and the illness of the assistant mayor, Senator Schwedler, who is in charge of Berlin's very considerable construction projects, welcomed the guests to Berlin for the DKG Congress.

The general meeting of DKG was held on October 4, and this in turn was preceded by an international press conference attended by the general and technical press. At the latter the position of the German rubber industry and the synthetic fiber industry was explained with relation to that of the rest of the world.

## Inaugural Session

The inaugural session of the Congress was held on the morning of October 5, with Dr. G. Fromandi, Farbenfabriken Bayer AG, president of DKG, presiding. He welcomed the delegates to the Congress on behalf of the Council of the DKG and extended a particular welcome to Burgomaster Franz Amrehn and to the honorary chairman of the Society, Dr. Erich Konrad, who had played such an important part in the development of synthetic rubber.

Dr. Fromandi mentioned that the main theme of the 1960 Congress was synthetic rubber but that the subject of synthetic fibers had been included for the first time. He referred to the developments in the field of organic chemistry during the past 30 years that had resulted in the chemistry of macromolecules, from which we have now the products of the synthetic rubber and fiber industries. He said it was impossible to imagine a modern economy without synthetic rubber and fibers, whose share in industrial activities had become greater and greater while the consumption of these synthetic rubbers and fibers was an expression of a high standard of living.

Dr. Fromandi said that the lectures at the Congress would reveal the international character of the science and technology of synthetic rubber and fibers and would also show new developments which would improve the quality of rubber goods, on which more severe demands are now being placed.

Burgomaster Amrehn in his address to the delegates called attention to the fact that West Berlin was a city of development, and that a practically new city had been built in the past ten years. He mentioned that Berlin was a divided city, and that many people had come from the Eastern to the Western part in the past several years. What had been done in West Berlin since the last world war shows to others what freedom can accomplish, he said.

Mr. R. Rzehulka, of the German Rubber Manufacturers Association, extended the welcome of that organization to the delegates. He pointed out that the German rubber industry had assisted and supported the DKG in many ways throughout the years, and

he paid tribute to Dr. Fromandi, its president.

The Carl-Dietrich-Harries Plaques were presented to Dr. Paul Baumann, general director, Chemische Werke Huls AG, and to Dr. Hermann Holzrichter, Farbenfabriken Bayer AG. Dr. Baumann was cited for scientific and technical work with acetylene and ethylene and for the electric arc process for the production of acetylene and for his work in butadiene-styrene copolymerization and his most recent activity in connection with the construction of the new Buna rubber factory at Huls. Dr. Holzrichter was cited for his work with neoprene, acrylonitrile-butadiene-styrene, and acrylonitrile polymers; for his work with synthetic rubber latices; and for activities in connection with the continuous polymerization of synthetic rubbers.

## Special Lectures

Dr. Baumann's special plenary lecture was entitled, **"The Development of Synthetic Rubber Since 1930,"** and included comments on research, large-scale industrial production, and the problems of analysis of elastomers.

The importance of butadiene as a source of synthetic rubbers was stressed, and the existence of the sodium and potassium mass polymers in 1930 mentioned. These have now been replaced by emulsion polymerized butadiene-styrene copolymers made on a continuous basis and at relatively low temperatures. The excellent quality of cold SBR was attributed to monomers of high and consistent purity, automatic control of the quantities of polymerization components, and improved means of controlling the degree of conversion of the monomers to polymers.

In discussing elastomers of technical importance, Dr. Baumann made the point that information which has been gained on the structure of some of the new elastomers indicates that the microstructure of the macromolecules of which the elastomer is composed has a more predominant effect on the rubbery elastic behavior of the material than the composition of the monomers. He presented a table of technically important elastomers which included natural rubber, polybutadiene, polychlorobutadiene, synthetic polyisoprene, SBR, butyl, nitrile, fluorine, polyacrylate, and ethylene propylene rubbers, and the polyurethane, polysulfide, and silicone rubbers, and chlorosulfonated polyethylene. This table gave the trade names, composition, and method of preparation of these elastomers and their production capacity in 1959.

The sodium polymer of butadiene is at present manufactured only in Russia. The recently produced polymers of *cis* 1,4 butadiene and isoprene show the former to have outstanding abrasion resistance and good resistance to heat, but the vulcanizates of *cis* 1,4 polybutadiene are somewhat inferior in tensile strength and flex resistance to those of synthetic polyisoprene and natural rubber, it was said. Hence, the tendency to use *cis* 1,4 polybutadiene in 50:50 mixtures with natural rubber.

In commenting on the ethylene-propylene rubbers, Dr. Baumann said that EP rubber is currently being tested particularly for its suitability in the manufacture of tires where its outstanding aging properties in comparison with rubbers based on diolefines were important. Cross-linking is brought about by peroxides, and the process can be accelerated in various ways. The near future will show to what extent EP rubber can compete in the field of tires and other rubber goods, he added.

The remainder of this lecture was devoted to modern methods for the analysis of elastomers since the trend to synthesize elastomers "to measure" made increasing demands on methods of test, especially direct analytical methods for determination of molecular structure; these latter have the advantage of providing an indication of rubber-like properties without the time-consuming tests of vulcanizates under service conditions.

The results of investigations of molecular weights, X-ray diffraction, and infrared spectroscopy characteristics of cold SBR, polybutadiene, and EP rubber, as carried out by Drs. Cantow and Breiner, of Chemische Werke Huls AG, were presented. A mean molecular weight of 500,000 and 2.4 cross-links per macromolecule were reported for cold SBR. Some details of the molecular structure of various polybutadienes, such as those of uniform steric structure as well as uniform copolymers of *cis* and *trans* adducts and pure polyblends of *cis* and *trans* polymers, were revealed. Molecular weight and chemical distribution curves of amorphous EP rubber were presented.

Dr. Baumann concluded his lecture on a note of optimism for the future of research on synthetic rubbers based on his opinion of the present generation of research workers.

In his special plenary lecture on **"Development of Man-Made Fibers for Industrial Applications,"** Dr. Alfred Ebert, Vereinigte Glanzstoff-Fabriken AG, first emphasized that development and use of synthetic fibers in rubber products in the various countries of the world had definitely not followed a uniform pattern. For example, cotton still accounts for about one-third of the fiber consumption of the West German rubber industry, but rayon is the predominant fiber in the tire branch where its use amounts to 88% of the total. Only 1% of nylon is used by the West German rubber industry, but this figure is expected to reach 5% in the near future. In contrast, the United States rubber industry consumption of nylon fiber has reached about 24% (40% in the tire branch); the remainder is rayon. In France, the considerable use of steel cord has resulted in a different pattern of consumption for various types of cord.

Paul Baumann, Chemische Werke Huls AG, who presented plenary lecture on synthetic rubber

Dr. Ebert provided data on the extent to which European rayon tire yarns in the conditioned and wet state and cord strength in the conditioned and bone-dry state had been increased in the past 10 years and predicted a continuation of these increases. They amounted to between 50 and 80% and were considered quite remarkable since 10 years ago no one would have expected the present strength values for rayon cord. Fatigue data on German rayon tire cord, as determined by the Firestone test, indicate a steep rise in absolute strength retained after 360,000 cyles; similarly the relative fatigue resistance, expressed as strength loss in percentage of original strength, showed a remarkable improvement during the past 10 years.

Water absorption of rayon tire cord has been decreased to two-thirds of the original value during the past 10 years, and this development parallels the increase in relative wet strength, now about 80%.

The properties of the conventional nylon 66 and the processes for its use in tire manufacture were reviewed; then Dr. Ebert compared the advantages of nylon over rayon and also cited its disadvantages. Nylon's greater tensile strength and impact resistance and its resistance to mildew and rot were first mentioned. Hot air shrinkage, a disadvantage in tire manufacture and the reason for the post inflation operation, seems to work out as an advantage in connection with heat build-up in the

tire during driving, as it tends to counteract tire growth, it was said. Nylon's disadvantages are its formation of flat spots in tires and the consequent louder driving noise, at least for the first few miles, and its higher price.

Nylon 6, or Perlon, has now been improved in thermal stability, and because of the lower cost of the raw material for nylon 6, it may be produced more cheaply than nylon 66. A decision as to which of the two nylons is better suited to tire manufacture cannot be made at this stage, it was said.

Polyester fibers are growing in importance in the industrial field, but their place in the rubber industry is still to be decided. In its present form polypropylene fiber was said to be of little use to the rubber industry.

Dr. Ebert concluded his lecture with comments on the use of synthetic fibers in conveyor belts, driving belts, and rubberized fabrics. Rayon is now being used to a considerable extent in conveyor belts in West Germany and rayon with nylon in combination for belts for coal mining. Synthetic fibers have made possible many improvements in driving belts, and the advantages of synthetic fibers for coated fabrics continues to open up new uses.

The first of the regular sessions of the Congress then began. Concurrent sessions were necessary both during the morning and afternoon in order to present the more than 60 papers on the Congress program. Abstracts of these papers will be presented with this report and in future issues.

## Social Activities

The main social event held in connection with the Congress was, of course, the banquet of the DKG on the evening of October 7 at the beautiful Palais am Funkturm in the broadcasting studios on the Masurenalle. The site of Radio Free Berlin, the building also includes exhibition halls, and there are also fair grounds as well as the radio tower located here.

In his remarks at the beginning of the DKG banquet, Dr. Fromandi reviewed some of the events of the Congress; then said that he was pleased to see so many ladies present to insure a pleasant social evening. Excellent food and wines were followed by fine entertainment; then dancing was enjoyed by the members and guests until the early hours of the morning.

On the evening of October 5, about 250 members, guests, and their ladies enjoyed an outing on the motorship *Ernst Reuter* on the Harvel Lakes, courtesy of Phillips Petroleum International Corp. A cold buffet supper, music, dancing, and a three-hour boat ride on a beautiful fall evening made this a very enjoyable event.

## Other Activities

As mentioned earlier, an international press conference was held on

Keystone

**A. Ebert, Vereinigte Glanzstoff-Fabriken AG, who presented plenary lecture on synthetic fibers**

October 4 at which the West German rubber industry was explained together with its relation to the rubber industry worldwide, and the developments in the use of synthetic fibers in the rubber industry were also covered. H. H. Kunckel, Bunawerke Huls, who handled publicity and press relations for the DKG Congress, presided at the conference and introduced the various speakers from DKG and the rubber and fiber industries and also presented his own review of rubber industry and DKG activities.

*Kautschuk und Gummi*, official publication of DKG, held a luncheon on October 5 for technical press, officers of DKG, the German Rubber Manufacturers Association, and certain of the delegates. Dr. S. Springer, editor of *Kautschuk und Gummi*, was host.

## Abstracts of Papers

### Elastomers—I

**Diene Rubber: A Linear Polybutadiene.** Glen Alliger, B. L. Johnson, and L. E. Forman, Firestone Tire & Rubber Co., Akron, O.

In the last few years, several stereospecific polymerization systems for butadiene and its homologs have been discovered. Recent work in this laboratory has shown that knowledge of the microstructure (i.e., the relative amounts of *cis*-1,4, *trans*-1,4 and 1,2 addition) of a polybutadiene does not adequately explain all of the physical properties which are significant in an elastomer for tire usage. Specifically, the properties of alkyllithium catalyzed polybutadiene are better than would have been predicted from microstructure alone and are, in fact, more in line with what might be expected of a polybutadiene predominantly *cis*-1,4 in structure. The data indicate that the amount of *cis*-1,4, if below the level required for crystallization of the polymer, does not materially affect the polymer properties.

Some of the other structural features which may account for the properties of a polybutadiene of mixed microstructure have been investigated. Data will be reported which indicated that alkyllithium catalyzed polybutadiene is a true copolymer of the *cis*-1,4, *trans*-1,4 and 1,2 units, and that it has a very narrow molecular weight distribution.

The techniques of polymerization and the technological evaluation of alkyllithium catalyzed polybutadienes in tire components, including evaluation in tires, will be presented.

**Development and Importance of Polybutadienes.** F. Engel, Marl-Huls, Germany.

Polybutadiene, the first commercially important synthetic rubber produced, had until recently been supplanted by newer, improved rubbers. Now Chemische Werke Huls is experimentally producing Polybutadiene Huls I and Huls II, which are compared with two types from other sources as well as with natural rubber. The Huls II type has the highest *cis*-1.4 ratio of all the polybutadienes considered; while its other values are generally satisfactory. Blends of Huls II and natural rubber (50/50) in tread compounds gave better scorch values than natural rubber 100%, and tested in tires showed better abrasion resistance, but results were less favorable for cuts and edge damage. It emphasized that the Huls II discussed represents a current stage of development and that experiments to improve it further are in progress. At the same time the original "screw" polymerization method of the early years of polybutadiene production is being reinvestigated, since it is considered to have technical possibilities, provided output can be suitably increased.

**Ethylene - Vinylacetate Copolymers and Their Cross-linking.** H. Bartl and J. Peter, Leverkusen, Germany.

By a system of radical polymerization at relatively low pressures and temperatures, high molecular weight ethylene/vinylacetate copolymers were obtained; molecular weight increased with increasing vinylacetate content. Products ranged from plastics type materials (20-30% vinylacetate) to those with rubber-like characteristics (30-50% vinylacetate). All the copolymers can be cross-linked with peroxides; cross-linking sites can be multiplied by a graft reaction in a special system in which peroxide vulcanization occurs in presence of small amounts of highly unsaturated low molecular weight compounds, e.g., triallyl cyanurate. The vulcanizates have good resistance to ozone, light, and weathering and especially to high temperatures and hot steam, but they readily swell in most organic solvents and have low resistance to acids.

**Rubber-Elastic Properties of Ethylene/Propylene Copolymers.** G. Natta, G. Crespi, and M. Bruzzone, Milan, Italy.

Examination of visco-elastic properties of ethylene/propylene copolymers indicates that they are well suited to the production of useful elastomers with excellent characteristics. Several cross-linking methods were investigated, and the properties of the vulcanizates are discussed. Some of these methods improved certain special properties with, in general, no effect on good basic characteristics, and some permit the use of curing agents generally employed for unsaturated types of rubber.

**First Use of a New Highly Elastic Ethylene/Propylene polymer.** C. Canevari and A. Morando, Milan.

The new ethylene/propylene elastomer cannot be plasticized by the usual mechanical methods and has little tack, but these difficulties can be met by selecting appropriate initial viscosity. As yet, certain peroxides are the only useful vulcanizing agents; addition of a limited amount of sulfur improves mechanical properties. Rate of cure is about the same as for butyl rubber compounds. Carbon black or other reinforcing fillers are necessary to insure desirable mechanical properties; carbon black mixes require no anti-ager. A plasticizer is indicated, but so far only Plastikator 32 has given satisfactory results. If the proper curing system is used, the copolymer can be blended with other elastomers. Ethylene/propylene vulcanizates have far greater resistance to hot air- and oxygen-aging, and very nearly the same resistance to ozone and nitric acid, as the usual rubbers, but no special resistance to fuels and mineral oils. Electrical cables and mechanical goods experimentally made from the new material are being tested under normal service conditions; tests on tread bands (for multiple-tread tires) show abrasion behavior not inferior to that of the usual tread bands.

**Butyl Rubber and Its Uses.** Von E. Dahl, G. Klotsch, and M. Langheck, Esso AG, Hamburg, Germany, and R. L. Zapp, Esso Research & Engineering Co., Linden, N. J.

The most notable advance in the use of butyl rubber has been the manufacture of the all-butyl tire in the United States where more than 500,000 such tires have been produced and sold since 1959. Manufacturing processes, properties of the tires, and test results were described.

First in Germany and later in other European countries, combination butyl tires with a butyl tread on a conventional SBR or natural rubber carcass were developed and found to give performance similar to that of the all-butyl tires. Combination butyl tires are still produced only on a pilot-plant basis; however, recent improvements in compounding and processing, tie-gums, and tread designs will soon permit the production of this type of tire on a commercial basis. Results of driving tests with German automobiles and under European road conditions indicate satisfactory performance characteristics for these combination butyl tires. Service life, abrasion and rolling resistance, road adherence, stopping distance, riding comfort, and noise level were all investigated, and the results reported.

In the wire insulation field, new insulation compounds have been developed which make it possible to produce cables capable of meeting more stringent service requirements.

Butyl rubber is being used increasingly for mechanical rubber goods, and new formulas for molded and extruded goods, sponge rubber, etc., were mentioned. The excellent weathering resistance of butyl rubber and its high damping power in connection with dynamic applications are of particular interest to the automotive industry.

Butyl rubber is used in mixtures with polyethylene, polypropylene, polyisobutylene and synthetic resins for many products in the plastics field. Polyethylene-butyl rubber mixtures have been particularly important in wire insulation and in the shoe industry.

Butyl-bitumen mixtures have been found useful in road building, in adhesive and sealing technology, for roofing materials, and for flooring products.

Butyl rubber latex, originally developed for impregnating tire cord, is now finding uses in the textile, paper and paint industries.

Chlorinated butyl rubber is compatible with other elastomers and should have wide application in conveyor belting and hose where high-temperature service is an important requirement. Other uses of this modified butyl rubber include white tire sidewalls and inner liners for tubeless tires, and in many industrial rubber products.

**Electron-Microscope Studies on the Micromorphology of Elastomers.** Th. G. F. Schoon, Wurzburg, Germany.

From the results of tests on Perbunan, cold Buna, 1,4-*cis* polyisoprene and Siloprene it is concluded that, like natural rubber, synthetic elastomers in ready-to-use, quasi-solid, amorphous state, structurally represent packed sphero-colloid macromolecules. But the copolymers examined attain a maximum of only two-thirds of the molecular diameter of natural rubber. It is suggested that the molecular coils of the copolymers, when dried in benzene solution, do not mat together, but that each individual coil dries out to maximum density.

### Man-Made Fibers

**Some Relations between Static and Dynamic Properties of Tire Cords.** G. Kemmnitz and G. Espanion, Cologne, Germany.

The relation of dynamic and static behavior of tire cord yarns of different twist and denier considered are: thread strength to its structure; impact-bending energy to twist; in-rubber flex-fatigue tests and thread structure; damping phenomena to results of static tests and (de Mattia) flex-fatigue tests.

**Carrying out Measurements of Tire Cord in Rubber and the Evaluation of the Results.** J. K. van Wijngaarden, Arnheim, Holland.

With a view to improving reproducibility and minimizing deviations of test results, a study of techniques of testing static and dynamic adhesion of tire cord in rubber and fatigue of tire cord, was undertaken in the A. K. U. Research Laboratories, in Holland. By using the Firestone flex fatigue test, this end was achieved by suitable modification of the apparatus, sample and design of the experiment. These changes are described, and it is added that other cord/rubber test systems may be similarly improved.

**Modern Viscose Tire Cord in Tires.** F. B. Breazeale, American Enka Corp., Enka, N. C.

Recent developments in tire design have put ever-increasing demands on tire cord properties. These requirements have been more than adequately met by recently developed viscose tire cords. Tyrex, Inc., a voluntary non-profit association has been formed in North America to maintain high standards and to promote the use of this material. Extensive testing has been done in the laboratory and, under the sponsorship of Tyrex Inc., in the field to evaluate the performance characteristics of the Tyrex tire cord.

In the laboratory, strength, modulus, and elongation have been determined at both low and high rates of strain. Heat and flex resistance have also been characterized. Significant improvements in strength level over earlier tire cords have been essential, but in order to use these increases in strength, improvements in flex resistance are also required. This aim has been achieved.

Since it is extremely difficult to translate laboratory results into end-use characteristics, several extensive road tests of tires were undertaken. These included evaluations of high-speed performance, treadwear, and carcass durability for passenger and truck tires. Tests were performed over city streets, turnpikes, highways, and rough secondary roads. The pattern of performance in the New York taxi tests is analyzed and discussed, and it is shown that the tires with Tyrex cord show a superior treadwear pattern as compared to nylon tires in the original tread. As the number of recaps increases, this picture tends to reverse itself. These results are based on a total of approximately 20-million tire miles.

Under conditions of desert highway driving, speeds of 128 mph. were

reached, and an average of 115 mph. maintained. In these tests the tires made with Tyrex cord showed a 24% advantage in treadwear over the nylon tires. As a result of special carcass and tread design, no tires were lost in this high-speed test.

Tests of overall toughness performed on rough secondary roads showed that the viscose cords performed as well as, or better than, the nylon cords. This result would tend to confirm the suggestion that low-speed laboratory testing does not give a true indication of end-use performance under conditions of high rates of loading.

A study of the effects of tire cord material on tire æsthetics, such as noise and vibration, indicate that the viscose cords perform quite well. This fact is particularly noticeable in the comparison of "flat spotting" where the stability of cellulosic yarn is a major advantage. Extensive studies of truck tires both on controlled fleets and commercial operations also point up the desirability of a stable carcass material. Here the tires with Tyrex cord show approximately 110 miles per thousandths inch of treadwear, with nylon tires being about 10% lower.

A brief discussion is given of the future possibilities in tire design and the role that viscose tire cords may be expected to play.

**A New Dielectric Method of Quickly Determining Moisture Content of Tire Cord.** E. Haase-Deyerling and H. Meumann, Hannover, Germany.

The design and the operation are described of a new electrical apparatus with which moisture content is determined of single, short threads of rayon tire cord, that have been freed of the surrounding rubber layer. The method is based on dielectric conductivity, and the means are explained by which clear relations can be established between water content and measurements. The influence is considered of rubber still adhering to the cord, the pretreatment of the cord, its type, count, and structure.

**Nylon in Tires.** H. G. Lauterbach, industrial products research laboratory, textile fibers department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

The rapid growth of the market for nylon in tires is traced, beginning with aircraft tires in the 1940's, extending through passenger and truck tires in the early 1950's, to a total of 41% of the total tire cord market in 1959. It is shown that the reasons for this growth are both technical and economic.

The primary performance advantages of nylon tires are high levels of static and dynamic bruise resistance and excellent high-speed performance. Data from both laboratory wheel and taxi fleet tests are discussed. The excellent durability of nylon cord tires provided the initial incentive for the adoption of nylon, but in order to broaden its use as a reinforcing material for all types of tires, the problems resulting from nylon's higher growth and cost have had to be solved.


Keystone

H. G. Lauterbach, E. I. du Pont de Nemours & Co., Inc., presented his paper on nylon in tires

It is shown how two important technical advances, cord hot-stretching and tire post-inflation, have contributed to the solution of the growth and cost problems. In addition, higher cord tenacity and lower yarn price have further reduced nylon tire costs, as has the recent development of reduced ply truck and passenger tires. With the development of this important new technology, it appears likely that nylon will continue to increase its share of the tire cord market.

**Methods of Testing and Evaluating Cord Yarn Fatigue in Tires.** Z. Bartha, Budapest, Hungary.

The method developed at the Hungarian Rubber Research Institute uses as test piece a solid rubber cylinder 20 centimeters long with diameter of 2 centimeters, in which the cord yarns are embedded lengthwise—at equal distances apart—around the outer circumference, so close to the surface that the top rubber layer over them is only a few tenths of a millimeter thick. The test piece, curved, is rotated about its own axis in a fatigue machine resembling the Schopper bar flexometer and is under alternate tensile and compressive stresses. The empirical relation of initial tensile and compressive stresses to the life of the cord is explained, and fatigue is represented numerically. Results indicate the importance of other factors, especially of flow phenomena, for the study of fatigue and for its evaluation, by the method which was described.

## Vulcanization—I

**Kinetics of Heat Curing of Synthetic Rubber and the Influence of Additives.** W. Scheele, Hannover, Germany.

The importance of vinyl side groups is brought out in this study of thermal cross-linking reactions, as observed in Perbunan N 2818. First, purely thermal vulcanization at different temperatures is examined, by measuring swelling in benzene, and it is suggested that heat curing is a radical process initiated by peroxide groups in the thread molecule at the vinyl side groups formed during polymerization. Next the acceleration mechanism of MBT and DBTS in heat-vulcanized Perbunan is dealt with, and elementary processes in curing with DBTS are discussed. Ten possible reaction steps are critically examined, of which three are favored by the author: (1) homolytic fission of DBTS; (2) the attack of RS radicals of DBTS on $CH_2$-groups in the alpha position on the macromolecule, with formation of MBT, and inactivation of the resulting pairs of resonance-stabilized polymer chain radicals; (5) a chain initiation at the vinyl side chains by the DBTS radicals.

**Studies on the Activation Energy of Vulcanization.** A. Franck, K. Hafner, and F. W. Kern, Munich, Germany.

Studies of kinetic reactions conducted in the works laboratory on a natural rubber compound containing a sulfenamide as accelerator and sulfur showed that the reciprocal equivalent time (time to reach a certain degree of cure) is a useful measure for the rate of cure. This value is determined from isotherms of the decrease in free sulfur, the 300% elasticity modulus, and tensile strength at various temperatures. The Arrhenius activation energy can be determined from the equivalent time and is an accurate measure, also for daily use, of the relation of rate of cure to temperature. A graphical method based on the Arrhenius equation is described which permits a comparison of vulcanizates obtained at variable temperatures with isotherms obtained in stage heating and, hence, application of laboratory results to manufacture.

**Sulfur Group Analyses in Natural Rubber Vulcanizates. II.** Application to Mercaptobenzothiazole Accelerated Stocks. Merton L. Studebaker, Phillips Chemical Co., Akron, O.

In a recent paper[1] a method of analysis was described which combined (1) reduction by lithium aluminum hydride followed by potentiometric titration and (2) total cross-link density from swelling measurements. For vulcanizates which do not revert during cure, the method gives values for polysulfide ($R-S-S_x-S-R$) and monosulfide cross-link densities.

In the present paper, the method is applied to a compounding study of

*(Continued on page 103)*

[1] *Rubber Chem. Tech.*, 32, 941 (1959).

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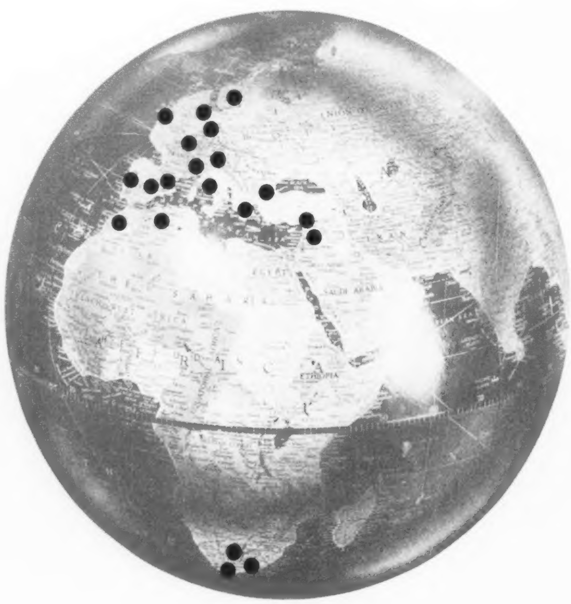

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**REGAL** GOOD NEWS FOR RUBBER **THE WORLD** OVER

Printed in U. S. A. November

*(Continued from page 94)*

2 mercaptobenzothiazole (MBT)-accelerated sulfur-cured vulcanizates. Reversion during cure is quite pronounced in many of these rubber compounds, and the method of analysis is used to illustrate in a semi-quantitative manner how reversion and monosulfide formation are influenced by zinc oxide and stearic acid levels in gum stocks and Philblack O (HAF) stocks.

**Initial Stages of Scientific Research on Rubber.** F. Kirchhof, Neulussheim, Germany.

The most important "firsts" in the history of research on the chemical and physical properties of natural rubber are reviewed and discussed, starting with Gough's work in 1805 on the thermal behavior of stretched rubber, down to the first reproducible results on rubber synthesis achieved by Fritz Hofmann and others in the early decades of the present century.

**The Diffusion of Sulfur S35 in Rubber.** H. Auler, Aachen, Germany.

The influence of carbon black concentration in rubber compounds on the diffusion rate of the sulfur, was examined at different temperatures. The diffusion coefficient (D) as well as the activation energies and constants were calculated, and a function which describes the relation of D to temperature and carbon black concentration could be developed, with the aid of which diffusion data on two giant tires could be mathematically verified. It was shown that during heating, sulfur migrates from the breaker strip, concentrating toward the carcass. Diffusion rate was found to be chiefly determined by the heating temperature and filler content of the mix: as the temperature rises, the influence of carbon black concentration increases and above 80° C. exceeds that of the temperature itself.

**Possible Uses of the Polarograph in the Rubber Laboratory and Special Methods of Analysis for Clarifying Vulcanization Processes.** F. Mocker and I. Old, Veith-Gummiwerke AG, Hoechst, Germany.

In the first part of this paper the principles of polarography, the apparatus, and the conditions for measuring current-voltage curves are outlined, and the qualitative and quantitative analyses of these curves are explained. An important factor is the composition of the basic solutions used, and details of several solutions are given. Applications are described of the method of analysis primarily of inorganic materials in testing raw materials or examining ash of rubber compounds and vulcanizates, and results are compared with those obtained by the usual methods. Included are determinations of total sulfur in vulcanizates and factices, and of zinc and lead content in vulcanizates. The possibility of determining free sulfur in vulcanizates is also indicated. The procedure is reported by which the method can be used to identify or test carbon black and white reinforcing agents via their methylene blue absorption.

The second part of this paper deals with the determination of organic accelerators, antiagers, and retarders for rubber, by methods which can also be adapted for testing raw materials and determining the content of compounding ingredients in batches, cured and uncured mixes. It is shown by the example of the conversion of dibenzothiazyl sulfide to 2-mercaptobenzothiazole during cures accelerated with the former, how polarography makes it possible to obtain information on the course of the reaction during vulcanization. Free sulfur, the reciprocal swelling factor, as well as mechanical properties were determined at different curing times and temperatures. Similar


Some of the exhibits at the German Rubber Congress: (A) Brabender Co. showing plastograph in foreground. (B) Haake Co. machines for determining processability. (C) Carl Frank with new Schopper ring cutter. (D) Vereinigte Glanzstoff-Fabriken AG display on use of synthetic fibers in rubber products

tests were also conducted on a reclaim rubber made from one of the experimental mixes.

**Vulcanization of Ethylene-Propylene Copolymers with Peroxides.** E. Di Giulio and G. Ballini. Soc. Montecatini. Ferraro. Italy.

The new ethylene/propylene copolymer, C-23, has an essentially saturated structure which, while, on the one hand, conferring good resistance to oxidation, heat and chemical agents in general, on the other hand makes vulcanization of the copolymer impossible by the means usually employed for unsaturated elastomers. Therefore a special curing system was developed based on the use of organic peroxides and sulfur, in equimolecular proportions among others, and this system was used for most of the specimens examined. The reaction mechanism of the cross-linking of saturated polymers by peroxides and the role of sulfur are explained: the choice of peroxides is discussed as well as the effects of various fillers, plasticizers, extenders, and the precautions their use entails.

*(To be continued)*

## Fort Wayne Meeting

Development of low-structure carbon blacks and use of carbon blacks in reinforcing rubbers were discussed by two officials of Columbian Carbon Co. at the first fall meeting of the Fort Wayne Rubber & Plastics Group on September 22. The dinner-meeting was held at the Van Orman Hotel, with 158 persons present.

William E. Ford, Columbian's Midwest district technical service manager, Akron, O., explained that low-structure, low-modulus carbon blacks were developed both to find a low-structure furnace black which would approximate properties of channel blacks at low cost, and to meet demands of automobile manufacturers for original-equipment tires which gave improved noise and ride properties without sacrificing resistance to wear. The natural gas from which channel blacks are made is growing increasingly more expensive, he noted.

Ford explained that the low-structure furnace blacks are in the fineness range of HAF, ISAF, and SAF blacks, but have a considerably lower level of oil absorption than those high-structure blacks. This was necessary in order to achieve the desired modulus and hardness he said.

In SBR the lower-structure blacks at 300% modulus show lower structure in the range of minus 600 pounds, roughly equivalent tensile strength, better elongation in the range of plus 100%, lower Shore A hardness in the range of minus 4-5 points, slightly poorer crescent tear at room temperature, less heat buildup as measured by Goodrich flex, better Mooney scorch properties, and lower Mooney viscosity.

Most of the processing properties will be more similar to those of channel blacks than to high-structure blacks, but these blacks all have typical furnace black cure, this speaker said. He also noted that these carbon blacks, because of their low structure, are more difficult to disperse than higher-structured carbons.

Robert A. Emmett, assistant technical director for Columbian Carbon, New York, N. Y., explained that tests have shown that both fineness of particle size and structure are important in SBR in increasing both modulus and tensile strength. In natural rubber, he said, structure raises modulus and detracts moderately from tensile strength, while fineness has no effect.

Emmett further noted that the optimum loading of carbon blacks for natural rubber is 25 to 30 phr., for SBR 50 to 60 phr., for nitrile rubbers 65 to 75 phr., and for butyl tensile strength is at its greatest in the pure gum and decreases with loading of carbon black.

New officers who took office at the meeting were Allen Bluestein, Anaconda Wire & Cable Co., president; A. L. Robinson, Harwick Standard Chemical Co., vice president; and Carroll Voss, General Tire & Rubber Co., secretary-treasurer.

## Ontario Opens Season

Bernie Van Arkel, R. T. Vanderbilt Co., Inc., was the first speaker for the Ontario Rubber Group's 1960-1961 season. He gave the Group a talk on compounding techniques, properties, equipment, and ingredients for wire and cable applications.

The talk included slides listing typical formulas and illustrated compromises necessary to obtain suitable properties to meet specifications with allowances for processing needs within the capabilities of compounding ingredients available. Van Arkel covered the subject in general terms to accommodate the non-technical men in the audience as well as people in other areas, but with sufficient detail to be of help to the wire and cable compounder.

About 65 members and guests were present for the dinner and cocktail hour preceding the talk. The meeting was held at the Clover Leaf Hotel on the western outskirts of Toronto, Ont., Canada.

### Group's Golf Tourney

The Ontario Rubber Group held its annual golf tournament on September 30 at the Dundas Golf & Country Club, Dundas, Ont., with about 150 members and guests present, of whom more than 100 were participants in the tournament. A suppliers' cocktail party and banquet rounded out the day's activities.

Winner of the Canada Carbon Black Trophy by virtue of his low gross score was Bob Lovell, B. F. Goodrich Canada, Ltd. The low net winner was F. D. Evans, Naugatuck Chemicals, Ltd. Runners up were: for low gross, Dean Bergman, Goodrich Canada, and for low net, T. R. Smith, Mansfield Rubber Co. Honors for high score were won by Joe Wolfe, Sun Oil Co., with his nearest competitor being Dick Clark, Dunlop Canada, Ltd.

## Elastomer Group Meets

Robert D. Stiehler, of the National Bureau of Standards, described a number of advances in rubber testing at the October 18 meeting of the Elastomer & Plastics Group, Northeastern Section, American Chemical Society. The meeting was held at Science Park, Boston, Mass., with 75 members and guests present.

Dr. Stiehler gave three examples of the types of work done by the Bureau in rubber evaluation. One was development of a vertical, cylindrical track on which tires might be run for evaluation of tread wear, with results that correlated closely with road tests on similar tires. The second was a study which showed that elongation was the only criterion of rubber aging which could be compared with service conditions, and the third was modification of a Wallace hardness machine which could determine hardness under wide ranges of temperature, solution exposure, and other environmental conditions, giving a close correlation to service life.

He also noted that mill and press temperature control is of great importance in work of standards quality. In evaluating compounds, he discussed the difficulty of correlating tensile data with service life.

Dr. Stiehler described the 18 standard materials produced by the Bureau for the rubber industry and outlined general phases of the Bureau's work, which include measurement of mass, length, time, and temperature. He also pointed out the fact that recent changes in standards in regard to these four basic measurements have been made, and he discussed the Bureau's work in regard to incorporating these changes.

At the meeting Henry A. Hill, National Polychemicals, Inc., was elected president. Joseph M. Donahue, Goodyear Tire & Rubber Co., was elected vice president; Henry S. Anthony, Tyer Rubber Co., secretary; Elmer E. Ross, T. C. Ashley Co., treasurer; Frank Canty, Terrell Corp., custodian; Warren Waite, Craig Systems, chairman of hospitality; C. Mijol, UBS Chemical Co., member of the executive committee.

# Chicago Rubber Group Hears Talk On Indoor, Outdoor Aging Tests

Frank Wilcox, of Witco Chemical Co., discusses weather aging tests at the fall meeting of the Chicago Rubber Group

Oscar & Associates, Inc.

New officers of the Chicago Rubber Group *(left to right)*: Robert Kann, secretary; Stanley Choate, president; Ted Argue, Roth Rubber Co., vice president; and Harold Stark, treasurer

The ozone box test adopted by the rubber industry as a method of predicting the weather aging characterisitics of rubber shows results that correlate well with those of outdoor exposure for neoprene and butyl polymers, but is not so useful for predicting aging of natural rubber and SBR polymers, Frank Wilcox, Witco Chemical Co., told members of the Chicago Rubber Group at their fall meeting. This meeting was held October 7 at the Furniture Club, with 185 members and guests present.

Wilcox explained that the difference in correlation between tests with neoprene and butyl, and tests with SBR and natural rubbers may be due to the difference between the temperature of the ozone box and roof tests in various parts of the country. Rubber stocks containing one kind of wax did well in the ozone box and in warm outdoor tests, but cracked when exposed on a rooftop in cold weather. Stocks containing another kind of wax did well in the ozone box, but aged badly in hot summer weather, he said.

## Three Wax Types

In comparing results of test pieces exposed in Southern California and those exposed in northern locations like Akron O., or Chicago, Wilcox explained that these types of wax are used to protect rubber from ozone. Type I is a paraffinic wax melting at 150-165° F.; Type II is a microcrystalline-paraffin blend melting at 145-150° F., and Type III is a microcrystalline-paraffin blend melting from 150-160° F.

He explained that in his tests, natural rubber tread stock containing Type I wax showed no cracking in the ozone box and none during summer weather in Akron. The north side of the sample, however, showed severe cracking in winter weather. SBR showed similar results, but cracked on all sides in winter.

A possible explanation, he said, is that Type I wax blooms well in a warm ozone cabinet or in warm weather, but that cold weather stops blooming, and the rubber is left unprotected.

Rubber stocks containing Type II waxes gave good results in the ozone box, but in summer weather cracked badly on the southern (sunny) side. None of these samples cracked on the northern (shady) side.

Wilcox further declared that there are two theories on this type of cracking, one that the wax is absorbed into the rubber under the heat of the sun, losing its protective value, and the other that ultraviolet light accelerates ozone cracking.

Type III wax, he went on, in some cases needs slightly more wax to reach maximum protection in the ozone box than is required for some Type I or Type II waxes. However, he added, the wax shows exceptional durability in outdoor exposure since, unlike waxes of Type I and II, it is effective over the wide ranges normally encountered in outdoor exposure. In both natural rubber and SBR, Type III waxes have protected samples on the Akron roof from cracking for more than two years.

Wilcox noted another lack of correlation between ozone box and outdoor tests. It is becoming necessary to use combinations of antiozonants and waxes wherever possible to protect against aging, he explained, and in the accelerated dynamic flex tests used to simulate actual service conditions the ozone box test did not correlate with outdoor aging.

One test was used to evaluate a white sidewall stock made from pale crepe. After 36,000 flexes in the ozone box, a stock containing two parts antioxidant and four parts wax had cracked badly; while a stock with antioxidant and no wax did not crack. When an experimental tire was made using the same formulations and placed in service in Los Angeles, the section containing only antioxidant cracked severely in two months. The section containing both wax and antioxidant had not cracked. It is presumed that the cracking occurred under static conditions when the tire was not being flexed, and that only the wax was able to protect the rubber at that time, he said.

## Business Meeting

During the business meeting, Group President Stan Choate, of Tumpeer Chemical Co., announced that he had appointed Robert R. Kann, of the chemical division, Goodyear Tire & Rubber Co., secretary of the Group to fill a vacancy caused when the former secretary moved from the area.

Harold Shetler, of Chicago Rawhide Mfg. Co., reported that the CRG course in basic compounding of rubber already had the largest enrollment in several years, and that only a few more openings were available. Harold Stark, of Dryden Rubber Division, Sheller Mfg. Co., reported that the golf outing was a financial success. John Groot, of Dryden Rubber Division, immediate past president of the Chicago Group, awarded a life membership to Paul Niessen, vice president of Victor Mfg. & Gasket Co., who was president of the Chicago Rubber Group in 1949-50 and has been an active member since then.

# First Annual ASME Rubber and Plastics Meeting Held in Erie

The use of rubber and plastics as engineering materials for structural and mechanical applications such as vibration and shock control, bonding of engineering structures, and non-rigid structures as well as some automation techniques for rubber and plastic processing highlighted the first annual Rubber and Plastics Conference of the American Society of Mechanical Engineers held in Erie, Pa., on October 9-11. The meeting was sponsored by the Rubber and Plastics Division of ASME with the cooperation of the Erie Engineering Societies Council and the Erie Section, ASME. This was a departure for this division which had previously held symposia in conjunction with the annual meeting of the Society. The importance of the subject along with the great success of this first conference should certainly indicate that this annual series should be continued.

The conference was divided into six sessions with three for rubber and three for plastics. Twelve papers on plastics and 14 papers on rubber were presented. The titles of these papers are listed below, and most of them are available from The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., in preprint form at a price of $1.00 to non-members.

The meeting also included a luncheon with Turner Alfrey, polymer research laboratory, Dow Chemical Co., as featured speaker. Dr. Turner presented a talk on the "Theory and Experiments in the Mechanical Processing of Plastics." The group held a social hour and barbecue at Presque Isle State Park on Monday evening which provided a pleasant interlude to the technical portion of the program.

**Session 1-A—Plastics**
**Chester Ward, Chairman**
**W. R. Byrd, Vice Chairman**

**Novel Design in Sandwich Structures.** A. C. Marshall, Hexcel Products, Inc.

**New Apparatus for Study of Mechanical and Electrical Properties of Plastics.** S. M. Skinner, Westinghouse Electric Corp., and E. L. Kern, Wright Patterson Air Force Base.

**A New Visco—Elastic Compound for the Suppression of Noise and Vibration in Structures.** C. H. Peterson, Hughson Chemical Co.

**Reinforced Plastic Films as an Engineering Material.** Johan Bjorksten, Bjorksten Research Laboratories, and William Cameron, Griffolyn Co., Inc.

**Plastic Pipe for Industry and the Home.** L. L. Loudin, Jr., Marbon Chemical Division, Borg-Warner Corp.

**Session 1-B—Rubber**
**G. L. Bruggemeier, Chairman**
**R. E. Weller, Vice Chairman**

**Principles of Processing Liquid Urethane Elastomers.** J. A. Hanzel, E. I. du Pont de Nemours & Co., Inc.

**Presses in the Rubber and Plastics Industry.** Everett Perlberg, Adamson United Co.

**Automated Tire Curing Room.** L. E. Soderquist, McNeil Machine & Engineering Co.

**Magnetic Rubber, A New and Useful Material.** R. J. Webster, Denman Rubber Mfg. Co.

**Session 2—Plastics**
**H. F. Wakefield, Chairman**
**F. M. Precopio, Vice Chairman**

**Air Structures—A New Concept in Engineer Design.** W. W. Bird, Birdair Structures, Inc.

**Thermoforming—Its Processes and Applications.** J. R. Lynch, Dow Chemical Co.

**Fillers and Stresses in an Epoxy Resin.** J. E. Rutzler, Jr., and L. G. Feinstein, Case Institute of Technology.

**Stress-Strain Relations in Cross-Linked Polyethylene.** I. L. Hopkins and R. P. Wentz, Bell Telephone Laboratories.

**Session 3-A—Rubber**
**E. H. Krismann, Chairman**
**G. M. Snyder, Vice Chairman**

**The Analog Computer and Its Application in the Rubber and Plastics Industries.** Adolph Katz and P. W. Berthiaume, Electronic Associates, Inc.

**An Introduction to Biaxial Stress Problems in Fabric Structures.** A. D. Topping, Goodyear Aircraft Corp.

**Expandable Structures for Space.** J. T. Harris, Goodyear Aircraft Corp.

**Elastomers as a Structural Material.** E. E. Thielker, Du Pont.

**Engineering Planning and Design Requirements for the Handling of Collapsible Rubber Containers.** Neuberne Brown, OTD Container Corp.

**Session 3-B—Plastics**
**R. C. Burck, Chairman**
**P. C. Roche, Vice Chairman**

**Design Strength Data and Calculations for Long-Term Use of Thermoplastics.** W. D. Harris, Dow Chemical Co.

**Obtaining Stress Percent Compression Diagrams of Foamed Plastics at High Rates of Compression.** R. C. Dove and W. E. Baker, University of New Mexico, and C. D. Beamen, Creole Petrol Co.

**Annual Review of Engineering Development in the Plastics Industry.** G. B. Jackson, Monsanto Chemical Co.

**Session 4—Rubber**
**Graham Morbey, Chairman**
**George McClelland, Vice Chairman**

**Dracone Fuel Barges: Some Problems of Design, Materials and Construction.** H. W. Hall, Ministry of Supply, London, England.

**Elastomers Applied to Structural Damping.** B. W. Campbell, Lord Mfg. Co.

**Automotive Engine Mount Design.** A. L. Everitt, Inland Mfg. Co.

**Elastomeric Gyro Suspensions.** J. T. Gwinn, Jr., Lord Mfg. Co.

**Plastic Films Continuously Laminated to Rigid and Semi-Rigid Substrates.** D. M. Wilkinson, C. A. Litzler Co.

## Reclaim Panel Held

A panel discussion on reclaim rubber was held September 29 at the annual fall meeting of the Southern Ohio Rubber Group. The meeting took place at the Engineers Club of Dayton, with 110 members and 20 guests present.

Charles O. Moore, manager of tire development for Dayco Corp., was panel moderator. Don McCollam, production manager of Naugatuck Chemical Division, United States Rubber Co., spoke on "Reclaim Rubber—Past, Present, Future"; Kenneth R. Garvick, development manager of Mansfield Tire & Rubber Co., discussed "The Use of Reclaim Rubber in Tires and Tubes"; John E. Brothers, chief chemist of Ohio Rubber Co., dealt with "A Mechanical Goods Compounder Looks at Reclaim Rubber."

## Canadian Advanced Technology Course

A ten-lecture advanced course in rubber technology will be presented at the Ryerson Institute of Technology, Toronto, Ont., starting on January 11, under the joint sponsorship of the Division of Rubber Chemistry of the Chemical Institute of Canada and the Ontario Rubber Group. The fee for the course will be $15.00, and those interested in taking it should contact L. Robinson, Canada Wire & Cable Co., Ltd., 147 Laird Drive, Toronto 17, Ont., Canada.

Subjects to be covered in the ten lectures are: (1) Emulsion Polymerization, (2) SBR and NBR, (3) Neoprene, "Hypalon," and "Viton," (4) Solution Polymerization, (5) Butyl, (6) Polyisoprene and Polybutadiene, (7) Natural Rubber, (8) Chemistry of Carbon Black, (9) Physical Chemistry of Carbon Black, and (10) Non-Black Fillers.

## OZO, Silicone, LD-227 Developments at NYRG

The latest developments and compounding techniques for nitrile-vinyl polymer blends, polysiloxane polymers, and fluid "Viton" were presented to the New York Rubber Group at the fall meeting.

The first speaker at the technical session as A. S. Krivitsky, Naugatuck Chemical, who covered "Applications of a Nitrile-Vinyl Polymer Blend." Mr. Krivitsky discussed the original compounding work on this type of blend and stated that Naugatuck research work had developed a particular blend which it manufactures in a unique manner and sells under the trade name, Paracril OZO. He went on to point out that this material has, in addition to the normal desirable properties of an NBR, excellent abrasion, fuel and oil and ozone resistance, and excellent color retention. Slides were shown giving some typical compounds and the physical properties derived from them. Many applications for this blend, both alone and mixed with other polymers, were presented and discussed.

"The Effect of New Vinyl-Containing Polysiloxane Polymers on the Inherent Characteristics of Silicone Rubber" was presented by C. W. Roush, Dow Corning Corp. Mr. Roush discussed the effects of vinyl substitution in the basic polydimethylsiloxane of the silicone rubbers. The methyl side groups of the basic polymer are very stable and give a good balance of fabrication properties, physical properties, and aging characteristics. The addition of phenyl groups extends the temperature range such that the polymers will not crystallize and will remain flexible down to —160° F. without loss of high-temperature stability. The chemical inertness of these phenyl side groups, however, although desirable in the final product, acts as a limitation to vulcanization. The vulcanization efficiency can be improved by substituting a small number of vinyl groups for the methyl groups in the polydimethylsiloxane. Some other features of the vinyl addition are vulcanizates of higher hardness, lower elongation, improved compression set, improved thick section cure, and less air entrapment in moldings. The speaker went on to discuss compounding for specific properties and aging characteristics.

The final paper at the technical session was given by R. C. Deskin, Du Pont, and was titled "Fluid 'Viton'—A New Development in Fluoroelastomers." This talk covered the properties of "Viton" LD-227 which is a low molecular weight polymer used as a processing aid in the higher molecular weight "Vitons." LD-227 is not recommended for use alone since it requires a large excess of accelerator for cure, and the resulting vulcanizate does not exhibit elastomeric properties. Deskin pointed out that LD-227 is used to replace 5 to 20 parts of the "Viton" for improved molding, extruding, and calendering characteristics without the deleterious effects of conventional plasticizers where maximum heat or environmental resistance is required. This replacement of "Viton" by the fluid leaves the compound with all "Viton" material, does not alter the pound volume cost, but does adjust the molecular weight distribution of the polymer. A reduction in accelerator is made in proportion to the fluid concentration because it will not cure in competition with the "Viton."

The technical session was followed by a cocktail hour and banquet. All sessions were held at the Henry Hudson Hotel on October 21. The speaker following dinner was Detective Kevin P O'Brien, New York City Police, who spoke on the workings of the Police Laboratory in his talk, "Instrumentation in Crime Detection."

During the meeting Chairman E. S. Kern, R. T. Vanderbilt, announced that the following men had been elected officers for 1961: chairman, Henry J. Peters, Bell Telephone Laboratories; vice chairman, Ralph DeTurk, Cooke Color & Chemical; secretary-treasurer, R. G. Seaman, RUBBER WORLD; sergeant-at-arms, W. Birkitt, Passaic Rubber; executive committee, R. T. Ambrose, Rodic Chemical, K. B. Cary, Woodbridge Plastics, W. C. Carter, American Hard Rubber, and A. M. Gessler, Esso Research.

## Catton and Perlberg Address Boston RG

Neil L. Catton, E. I. du Pont de Nemours & Co., Inc. described a proposed new method to replace ASTM D 735 (SAE 10R), and S. Everett Perlberg, Adamson-United Co., discussed modern mill room and calender facilities at the fall meeting of the Boston Rubber Group. The meeting was held October 14 at the Somerset Hotel, with 150 members and guests present.

Catton, in his talk titled, "A Practical Method of Classifying All Elastomeric Vulcanizates," explained that the proposed change in classification substitutes stock resistance to heat and oil swell as criteria for stock classification, rather than composition of the elastomer. Requirements are the tensile, elongation, and hardness properties as influenced by 70 hours' exposure at selected temperatures; maximum changes for the respective properties are set at ±30%, —40%, and ±15%.

Two tables are provided, one listing available properties, and one listing suffix requirements. The purpose of the change was to make the system of classification a better guide to engineering needs and to make it more flexible to accommodate any new elastomers developed in the future, Catton said.

Limits are also set for each class of stock on resistance to swelling in ASTM #3 oil after 70 hours of exposure at 150° C.

Perlberg discussed "Modern Mill Room and Calender Facilities" and included such new machines as the Intermix, the Dynamatic drive, new portable mills, drilled mill rolls using 160° water, stripper knives controlled pneumatically or electrically, horsepower control charting, recirculating water and extended tooth gears for mill connecting gears, new types of calenders, etc.

J. Russell Dolan, New England Telephone & Telegraph Co., spoke, following dinner, on the new developments in telephones and showed a film on the Echo satellite.

Fay Foto Service, Inc.

**Wm. H. King, Acushnet Process Co., chairman, Boston Group's speakers' committee; S. Everett Perlberg, speaker; Neil L. Catton, speaker; James J. Breen, Barrett & Breen Co., Boston Group chairman *(left to right)*, at Group's October 14 meeting**

# washington report

By JOHN F. KING

## Industry Seeks to Expand Rubber Products Export, Reduce Red Tape

The rubber industry may be getting somewhere in its efforts, in cooperation with the government, to expand exports of American rubber products. The industry in June drew up a long list of actions the government should take to strengthen export outlets for rubber goods,[1] including eliminating export-licensing red tape and bargaining hard for rubber tariff concessions by other nations. The list was presented to Commerce Department officials at a joint government-industry conference and was conceded by both sides to constitute a pretty tall order.

One of the proposed actions where some headway seems to have been made is the industry's request that at least half of all foreign aid funds spent abroad be channeled to U. S. suppliers instead of procuring the goods "offshore." Commerce Department officials at the June meeting indicated that little could or would be done on this item.

### More "Buy-U. S." by Defense

However, in October, the Defense Department issued a set of procurement directives to the military services' purchasing agents that may go some distance toward meeting the request of the industry for a little more "Buy-American" emphasis in the foreign aid program.

Defense Secretary Thomas Gates on October 6 told the combined services that henceforth American suppliers were to be "favored" over competing foreign suppliers in the procurement of any goods which the defense establishment buys for use overseas. This "Buy-American" preference, Gates said, is to apply wherever it does not involve additional costs.

The Gates order—which could affect more than $2 billion annually in military spending overseas on just about everything from soup to nuts—sweeps away pre-existing Defense procurement policies which emphasized that foreign suppliers were to be favored where foreign goods were not more expensive than U. S. goods. The old policy was framed back in the days of the Marshall Plan when the U. S. was trying to get its allies back on their economic feet.

Pentagon spokesmen made it clear that the Gates order was not designed to help any specific U. S. industry get a bigger slice of the melon which is the military's overseas spending programs. Rather, they said, the idea was to improve the worrisome deficit in the overall U. S. balance of payments—the deficit in amount this country pays out in international transactions over and above what it takes in. The deficit, which will exceed $10 billion for the three-year period 1958-60, is the main factor in the outflow of U. S. gold to other countries which has alarmed some people in the government. The Pentagon said Gates' "buy-American" order is designed merely to increase total U. S. exports and thereby pare down the payments gap.

The Pentagon's spending experts estimate the diversion of orders from foreign to U. S. suppliers will not exceed $30 million in the first year of the new policy. Other knowledgeable government experts on the issue say the Pentagon is playing down the impact of the switch in policy, and that a good deal more than $30 million is involved.

All hands concede, however, that it is impossible to forecast the dollars-and-cents magnitude of the new policy. Only time and experience with it will tell.

What the Gates order affects, specifically is this:

(1) All so-called "offshore" procurement under the military aid program, which involves everything from clothing to weapons systems, that this country finances for its poorer allies. Currently, this spending total is running about $500 million a year.

(2) All supplies and services purchased for use by U. S. forces stationed abroad (not U. S.-based forces). Again this could affect everything from building materials, vehicles, weapons and so forth.

(3) All purchases for G. I. post exchanges overseas.

### ICA Purchases Omitted

The Defense order does not affect a couple of spending programs which rubber industry spokesmen have indicated they would like to be cut in on.

These include offshore procurement of economic aid for poorer allies which is carried out by the International Cooperation Administration and amounts to about $2 billion a year, and offshore spending of funds supplied other nations through the Development Loan Fund, which now runs well over $100 million a year. DLF a year ago inaugurated a "Buy-American" policy of its own when the balance-of-payments problem first got attention, but this has had little impact on suppliers of consumer and durable goods.

ICA's $2-billion-a-year spending operation, however, has meant business for a number of U. S. rubber companies, since its procurement involves more end-use items such as tires which are needed in less-developed nations. In the only figures on this spending which have been made public[2] U. S. rubber companies netted about $17 million in a 2½-year period ending in fiscal 1958. These were for direct purchase orders for ICA procurement in this country of goods needed abroad. In issuing the direct-order total, though, ICA emphasized that U. S. rubber firms probably realized indirect gains—through the supply of other firms with prime procurement orders—that at least equalled the direct total.

ICA periodically is subject to pressures to drop its "offshore" policy emphasis and switch, as the DLF and now the Pentagon have switched, to a

[1] See RUBBER WORLD, July, 1960, p. 102.
[2] See RUBBER WORLD, Aug., 1958, p. 756.

"Buy-American" policy. ICA officials aver the offshore buying operation will continue, notwithstanding the Pentagon decision to favor U. S. suppliers in offshore procruement.

A number of observers in Washington, however, are inclined to believe ICA will come around when it becomes clear the payments deficit will continue for some time to come, as most experts expect it to.

## Industry Expects More Fourth-Quarter Profit

Barring a sharp dip in general economic activity in the last three months of the year, the nation's major rubber companies will make money, considerable amounts of it, in 1960. Another big if in the situation is whether there will be a continuation of more reasonable prices for natural rubber through the last quarter.

The earnings outlook for the rubber industry this year has improved substantially since mid-summer. Then, financial reports for most of the major firms showed there probably would be sharp reductions in earnings this year below 1959 levels. The absorption of a new round of wage increases at mid-year, plus the wave of price-and term-shaving in sales practices of the companies indicated 1960 would be a thin year.

But earnings experience in the third quarter has begun to encourage the larger rubber and tire producers to believe they would escape the profit squeeze which appears to grip American industry generally this year.

What has happened is that several factors came into play as 1960 moved into its second half. Discounts, which since last year had been liberally allowed on truck and passenger tires, were narrowed; while promotional allowances on second- and third-line tires have been reduced by half.

Coupled with this situation was the downward drift of "true" rubber prices that set in this summer after a phenomenal period when nothing—the cessation of Communist buying and rather large-scale stockpile disposals—seemed to shake the natural rubber price structure. The last few months have seen natural prices drop 10¢ a pound from the 49½¢ high of November, 1959.

This reduction in expenses was more than enough to offset the average 9½¢-an-hour wage rate increase granted the United Rubber Workers Union as of August 1. Industry economists estimate labor costs run about one-third of total industry costs, while materials cost runs as much as half.

The extent of the mid-summer profits squeeze came through in second-half financial reports issued by the rubber companies. Smaller firms, particularly, were hurting although the larger companies with extensive overseas holdings withstood the squeeze fairly well.

Mansfield Rubber, for example, netted only $44,000 in the second quarter, compared with $713,000 in the April-June period of 1959; Mohawk Rubber likewise dropped from $387,-000 to $345,000.

At the same time, Goodrich net earnings dipped in the second quarter to $9,098,000 from the $9,288,000 mark of April-June a year ago; Goodyear slipped from $23,650,000 to $20,668,-000, and United States Rubber dropped from $8,757,000 to $8,557,000.

Industry observers and company spokesmen expect the fourth quarter will be good enough to pull up total profits for the year to a better-than-expected level.

## Inland Rubber Corp. Denies FTC Charges

Inland Rubber Corp., Mansfield, O., in October denied Federal Trade Commission charges that it unlawfully is charging competing customers different prices and asked FTC to dismiss the July 20 complaint. Replying to an FTC complaint issued last July, Inland admitted it formerly allowed merchandise credits ranging from 2% to 10%, based on annual volume of purchases of repair products. But these credits were discontinued in May of 1958 and have not been granted since, Inland said.

Inland's answer to the FTC complaint specifically denied that some customers received lower prices than their competitors as a result of being allowed to combine and accumulate quantities of products. It also denied FTC's allegation that favored customers have been permitted various combinations and accumulations of purchases in order to qualify for largest discounts allowed on lot purchases of certain types of tubes.

Rather, Inland said, its graduated lot prices have been granted "in order to meet competiton and in accordance with the prevailing industry practice." Moreover, the company added, the graduated lot prices were "available to all of its customers."

Another aspect of FTC's complaint charges that since May, 1958, Inland customers classed as "Warehouse Distributors" have received net prices up to 18% lower than competitors, and that this classification included "group buyers" who received preferential prices through combined purchases. The company's answer asserted that the 18% discount is given "to all customers who qualify as warehouse distributors" and that sales to a few so-called "group buyers . . . have been discontinued."

FTC brought the charges against Inland on grounds the firm's price differentials may result in a substantial lessening of competition or tend toward monopoly.

## URW Elects Burdon

George Burdon took over the presidency of the United Rubber Workers Union in late September and promptly put the 180,000-member labor organization squarely behind the Kennedy-Johnson ticket in the November election.

"If we expect legislation to support us, we must make the right decisions at the ballot box," the new URW chief said at URW's twenty-fifth anniversary convention in St. Louis. "I say the choice is between progress and disaster, and that the choice for progress is the Kennedy-Johnson ticket."

His view was upheld by the 1,600 delegates who voted unanimously to support Democratic Senators Kennedy and Johnson against Republican Vice President Nixon and his running mate, Henry Cabot Lodge. The convention's resolution said that while Nixon "voted against the public interest 87% of the time, Kennedy has a 100% record of voting in the interests of better housing, more adequate wages for exploited workers, for better education and teachers' salaries, and for fair labor legislation to help protect the rights of workers both organized and unorganized."

In calling for election of a "good president and a liberal Congress," Burdon pledged that he as URW president would work for an expanded program of labor education, time-study training, legislative action, and a public relations program.

Burdon, who is 51, formerly was URW's international organization director. He will succeed retiring president L. S. Buckmaster, who headed the Union for 15 years. Burdon won the election by a 1,156-463 vote over Paul E. Bowers, URW pension and insurance director.

## Tunku Visits Akron

Tunku Abdul Rahman Putra, Prime Minister of the Federation of Malaya, after a brief stay in Washington, visited the rubber research and plant facilities at Akron, O., the first week in November as part of a 10-day visit to the United States as the guest of President Eisenhower and the United States Government.

The Prime Minister made a tour of rubber plants in Akron. This tour was climaxed with a dinner in his honor given by leaders of the rubber industry.

The Tunku was accompanied on his trip by an entourage of 15, including State Department officials.

Known as "Bapa Merdeka," or Father of Malayan Independence, he was able to unite a nation of numerous races, religions, languages, and cultures into one people, at the same time defeating a Communist-led insurrection which lasted 12 years.

# industry news

Pach Bros.

George R. Vila

## Vila Succeeds McGovern As U. S. Rubber Head

George R. Vila was elected president and chief operating officer of United States Rubber Co., New York, N. Y., at a meeting of the directorate on October 19, succeeding John W. McGovern, who retired after 40 years of company service. McGovern will continue as a member of the board of directors and of the executive committee.

Prior to assuming his new post, Vila spent three years as group executive vice president in charge of the company's Naugatuck Chemical, textile, international, and plantation divisions, and two company subsidiaries, Dominion Rubber Co., Ltd., (Canada), and Latex Fiber Industries, Inc., Beaver Falls, N. Y.

Vila came to U. S. Rubber in 1936 as a salesman for rubber chemicals in the Naugatuck Chemical Division. With the advent of World War II, he was assigned as research and development manager to head development of new types of synthetic rubber. In 1945, the war over, he joined a technical mission and visited Germany to study that country's synthetic rubber industry.

He returned to selling in 1946 and in three years rose to general sales manager of the Naugatuck Chemical Division. In 1953, Vila became assistant general manager of the Division and in 1957 was elected divisional general manager and company vice president. Later the same year he became group executive vice president for the company.

Vila is a past member of the board of directors and executive committee of the Manufacturing Chemists' Association, a director of the National Agricultural Chemical Association, and a member of both the American Chemical Society and the Society of the Plastics Industry.

Vila, 51, a native of Philadelphia, Pa., received his A.B. degree from Wesleyan University in 1932 and an M.S. degree in chemical engineering from Massachusetts Institute of Technology in 1933. Following graduation he spent three years as production and development engineer with Boston Woven Hose & Rubber Co.

## Truck Test Cited As Proving Tyrex Best

Tyrex, Inc., has cited results of a test made with a Texas truck fleet to show proof of the superiority of tires with Tyrex tire cord over those made with nylon cord.

Tyrex officials, speaking at a press conference held in conjunction with the convention of the American Trucking Association in New York, N. Y., October 18, said the tests had indicated that Tyrex cord tires have nearly twice as much tread mileage as nylon cord tires.

Tyrex is an association of five major manufacturers of rayon tire yarn and cord. Tyrex, a new type of high-tenacity rayon cord, has been in use for the past three years.

According to William Dalton, president of Tyrex, Inc., the tire test made on the trucks of the Ray Smith Associated Cos. of San Antonio, Tex., showed that at 81,714 miles, the Tyrex cord tire had 62% of the original tread depth at the crown, while the nylon tire had only 35%. At more than 100,000 miles the nylon cord tire was ready for recapping, while the Tyrex tire had about half of its original tread depth left, he said. He stated also that it was estimated that the Tyrex tire had 79,709 miles of wear left.

Dalton declared the tires were identical except for the cord and were operated on opposite sides of the same axle over the same roads and carrying the same loads.

Don Walker

## Don Walker Represents RW in Chicago Area

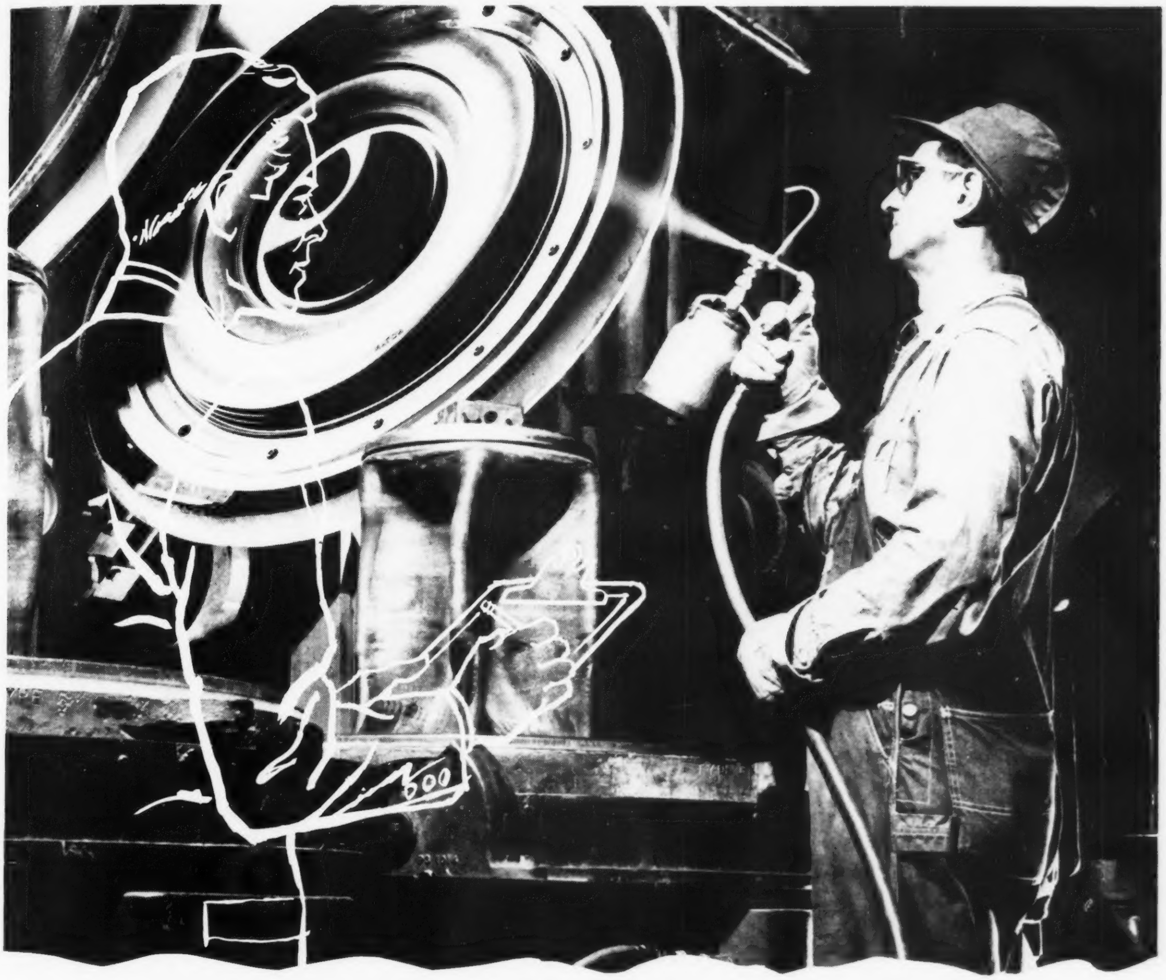
Donald J. Walker joins Rubber World's sales force as midwestern sales representative, operating out of the Chicago, Ill., office. He brings with him a 12 year sales background in industrial bonds, drugs and cosmetics, plastics, and office interiors.

He was most recently associated with Designs for Business. Before that he covered the East and Midwest for Pioneer Plastics Corp. and for the laminating and insulating plastics department of General Electric Co.'s chemical division. He was also associated with Lehn & Fink Products Corp. and Salomon Brothers & Huttler.

Mr. Walker studied mechanical engineering at New York State Maritime Academy and United States Merchant Marine Academy, as well as finance and banking at New York University. A native New Yorker, he attended McBurney Prep School in the city. From 1950 to 1952 he was in the Army and spent a year in Germany.

In his spare time he skiis, sails, swims, and plays bridge.

In making the announcement of Walker's appointment, RW advertising sales manager, R. L. Miller, said that the move was made to keep abreast of increasing activity in the rubber industry in this vital Midwest area and to provide added service to advertisers there.



## HOW THE SILICONES MAN HELPED REMEDY MANY TIRE MOLD RELEASE HEADACHES

Today you can simplify and lower the cost of inside and outside tire paint formulations, including tread release agents—with a versatile line of silicone oils perfected by your UNION CARBIDE Silicones Man. It includes:

- L-522 Silicone as a base for inside tire paint using Bag-O-Matic technique.
- The same silicone for outside paint. Does not interfere with knitting.
- LE-45 Silicone diluted to 1% or less, sprayed or swabbed in mold, for sure release of intricate tread designs. Or, LE-46 Silicone—the *only stable emulsion* made from high viscosity silicone fluid. It can be diluted up to 30% more than emulsions made from lower viscosity oils.

All these UNION CARBIDE silicones prevent residue build-up in molds, keep patterns cleaner. They are heat-stable and do not cause soot, smoke, or flammability problems.

Your Silicones Man can help with your mold release problems in tires, mechanical rubber goods, plastics, many other fields. Contact one of the offices of The C. P. Hall Co., or write Dept. KS-4004, Silicones Division, Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Bakelite Division, Toronto 12.

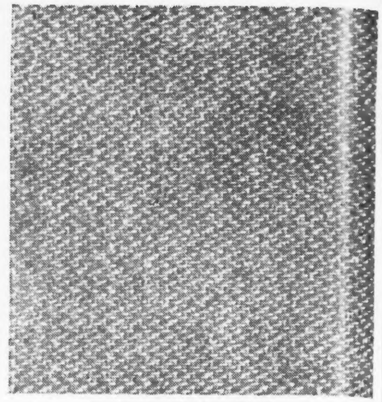
**Unlocking the secrets of silicones**

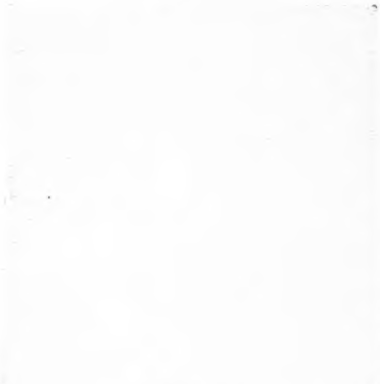
**Rubber, Monomers, Resins, Oils and Emulsions**



**UNION CARBIDE SILICONES**

# THERE'S T



Cotton Broken Twill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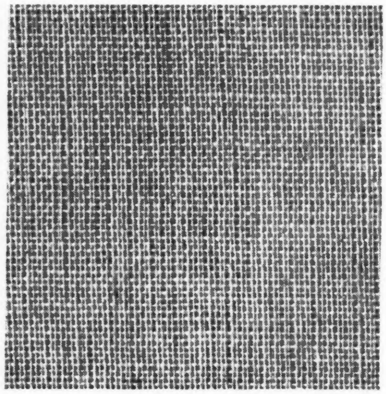
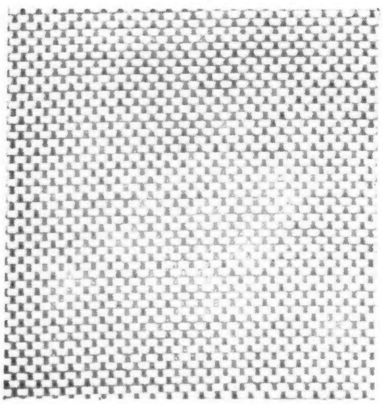

Cotton Chafer


Spun Rayon


Welkote Filament Nylon


Knit Kote


Lantuck

Shown here is just a tiny sample of the many quality base fabrics offered by Wellington Sears for both plastic and rubber coating. The entire selection is more complete and up-to-the-minute than can be found anywhere else in the textile industry.

There are wovens, non-wovens and knits in cotton and synthetics for every coating application. All are continuously proving themselves—in a variety of uses ranging from air-supported domes and collapsible fuel tanks to luggage, upholstery and garments.

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## New Firestone Plant Set for Polybutadiene

The Firestone Tire & Rubber Co.'s new polymer plant at Orange, Tex., designed for production of both *cis*-polyisoprene and *cis*-polybutadiene, is scheduled for completion in January.

The plant, with an annual capacity of 30,000 tons of either Coral, Firestone's *cis*-polyisoprene, or Diene, its *cis*-polybutadiene, will be devoted to production of Diene at first, the company said. This, the company explained, is because of the promise Diene holds for improving the quality of natural rubber in blends.

Production of Diene has already been tested in a pilot plant in Akron and has been in production for the past nine months. The synthetic is already used in Firestone's premium passenger-car tires, and its resiliency and low-temperature qualities make tires more durable. The new synthetic also improves tread wear and traction on ice and snow and is more resistant to tread cracking than natural rubber.

The company's present synthetic rubber capacity is 251,000 tons a year at plants in Akron, O., Lake Charles, La., and Pottstown, Pa., and the addition of 30,000 tons of facilities will increase Firestone's capacity for synthetic rubber production by nearly 12%.

The plant, being built as an addition to the Firestone petrochemical center, is designed to permit the easy switch from *cis*-polybutadiene to *cis*-polyisoprene or back again as demand requires. Engineering design work is completed, and most of the major equipment is in the plant.

## First Malaya-Chicago Seaway Service Begins

The first regular cargo service between the Far East and the Great Lakes began recently when the *Salatiga*, a 7,500-ton ship carrying rubber, tin, and other products, sailed through the St. Lawrence Seaway and ended her run in Chicago, Ill. The *Salatiga*, a Nedlloyd Lines vessel, was carrying 1,000 tons of rubber contracted for by H. Muehlstein & Co., Inc., raw materials broker for the rubber and plastics industries.

The *Salatiga* had made stops in Ceylon, Malaya and the Philippines before heading for the Seaway via the Suez Canal.

Since that time two other ships of the line have made the trip, stopping at Montreal and other St. Lawrence ports, and docking at Detroit, Cleveland, Milwaukee, and Chicago after passing through the Seaway and into the Great Lakes. The ships were the *Amperian* and the *Nias*.

Muehlstein and other shippers had previously had to have cargo transferred from ocean-going ships to shallow draft vessels in order to get to the Great Lakes by water.

Although shippers are expected to use the Seaway route to some extent, and Nedlloyd Lines definitely plans to continue its regular service, the St. Lawrence River is frozen from November or December until early April. Since those are the months of peak rubber use by manufacturers, the Seaway is expected to be used for only a limited amount of rubber shipments.

Chicago Sun-Times

**Chicago's first shipment of natural rubber via the St. Lawrence Seaway, marking the start of a regularly scheduled service from the Far East, is inspected, *left to right*, by Gerritt P. Keers, vice president Nedlloyd Lines; Capt. Jack H. Van Swisk, captain of the *Salatiga;* Alfred Stein, vice president of H. Muehlstein & Co. Inc., who received the rubber; Dave Kenny, Muehlstein; and Capt. J. J. Manly, Port Director**

## Mechanized Farms Seen Boosting Tire Sales

"A great increase in mechanization on the farm is a virtual necessity in light of the rising total population and declining farm population," Joseph W. Haney, farm tire manager for The Goodyear Tire & Rubber Co., Akron, O., on October 18 told members of the National Retail Farm Equipment Association at their annual meeting in New Orleans.

Haney pointed out that increased mechanization will be a major influence on tire sales, since farmers today buy one of every five tires sold in the tire replacement market.

He said that the number of farms dropped from 5.6 million in 1950 to 4.5 million in 1960 and is expected to drop to 2 million by 1975; while the size of the average farm grew from 150 acres in 1939 to 215 acres in 1950 to 300 acres today. The average farm size is expected to increase to 450 acres by 1975, he declared.

By 1975 the United States is expected to have a population of 225 to 230 million, and 350 million by the year 2000, Haney states. To feed this number of people farms must double their production of foodstuffs, either by farming an additional 500 million acres of land or by increasing production per acre, he said.

Noting that "spreading urban areas, growing networks of highways, and construction of shopping centers and factories are steadily reducing the amount of land available for farming," he argued that mechanization will be necessary to increase production per acre in order to meet the demand.

## Cabot Changes Name To Cabot Corp.

Godfrey L. Cabot, Inc., Boston, Mass., and its three subsidiaries, Cabot Carbon Co., Cabot Shops, Inc., and Cabot Gasoline Corp., have been merged into a new corporation, Cabot Corp.

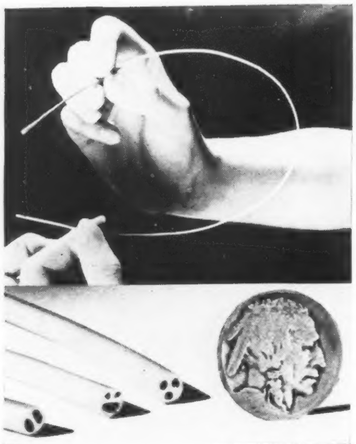
Cabot Corp. produces carbon black in Canada, England, France, and Italy, operates jointly with another U. S. firm a plant in Australia, and also licenses plants in Holland, West Germany, and Japan.

## Apprentice Training In Tire Mold Making

The Firestone Tire & Rubber Co., Akron, O., is offering an apprentice course in tire mold making, said to be the first offered by the rubber industry. Other apprentice programs are offered for general machinist, electrician, pipefitter, instrument repair, machine repair, sheetmetal and iron work, power engineering, and pattern making.

The new course, which will train young men in the skills necessary to produce the complete tire mold from rough casting to the final product, will include two to three hours of classroom work weekly for four years, with the rest of the 40-hour week devoted to on-the-job training in boring mill operations, mold engraving, and mold finishing.

The trainee will also attend four hours of evening classes a week at Akron's Adult Vocational School for three years. The company will pay the tuition and provide textbooks for classes at the plant.



**The Natural Rubber Bureau, Washington, D. C., has released some pictures of uses of superior processing (SP) rubber which was introduced to the industry several years ago. This rubber is modified to make it more easily processable in extrusion or molding operations. Shown in the pictures above are some surgical extrusions which take advantage of the low die swell and retention of shape during cure that are characteristics of this material. In the top photo is shown a catheter with the very small diameter of 1.25 mm. In the lower photo the nickel indicates the small size of these fine surgical tubes, each with two or more separate channels of differing size and shape, which were also made with this superior processing rubber.**

## United Carbon Plans Pacific Coast Plant

United Carbon Co., New York, N. Y., plans building a carbon black plant with initial capacity of 64 million pounds in Southern California to serve the Pacific Coast area. The plant, scheduled to go on stream next year, will initially produce a wide range of furnace blacks for tire and retread compounds as well as for mechanical goods applications.

Carbon black is not now manufactured on the Pacific Coast, but is shipped in from plants in the South and the Southwest.

"Most of the major tire and rubber goods producers have either built manufacturing facilities in the area or have purchased property for future building," R. W. French, president of United Carbon said. "It is, of course, a logical pattern for raw material manufacturers to follow the lead of their customers and provide improved and more economical service through localized sources of supply."

He pointed out that sustained high population gain and rapid industrialization of the Pacific Coast have increased automobile and tire sales; he predicted that the area's carbon black consumption should continue to increase at a faster rate than in other areas.

## New General Plant For Evansville, Ind.

The General Tire & Rubber Co. will build a new industrial products division plant in Evansville, Ind. Installation of equipment will begin shortly, and the plant is expected to be in limited production early next year.

Three other operations of the industrial products division are located in Indiana, at Wabash, Marion, and Logansport. The company also has industrial products plants in Newfields, N. H., and Welland, Ont., Canada.

General Tire's industrial products division manufactures molded and extruded rubber parts, plastic parts, polyurethane foam, metal parts and metal-to-rubber parts, and certain military items.

## Simon Collier Given Quality Control Medal

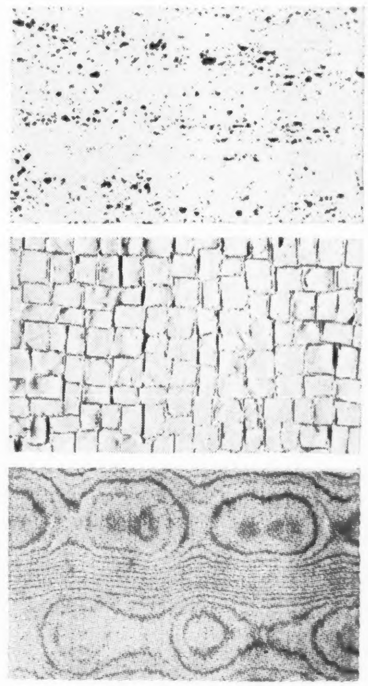
Simon Collier has been awarded the first George D. Edwards Medal of the American Society for Quality Control for his efforts in promoting industrial quality control.

Collier, a former president of the American Society for Quality Control, is chairman of the American Society for Testing Materials Committee D-11 on Rubber and Rubber-like Products, a post he has held since 1944. He also has been chairman of Committee E-11 on Quality Control since 1958, and secretary of Committee C-17 on Asbestos Cement Products.

He retired last year after 36½ years in the rubber industry, first as associate chemist with the National Bureau of Standards from 1917-1918 and 1919-1923 and later with Johns-Manville Corp. from 1923 to 1959. A former chairman of both the Chicago Rubber Group and the New York Rubber Group, he was director of quality control at Johns-Manville from 1946 to 1959 and currently is a quality control consultant specializing in asbestos and rubber products.

While at Johns-Manville, Collier presented a film, "Modern Quality Control," and outlined methods used in the company's quality control program before an estimated 70,000 persons at meetings of industrial groups, technical societies, and universities.

The Edwards Medal, named after a former president of the American Society for Quality Control, is to be awarded to persons who have made contributions through administrative service to the advancement of quality control. Another medal is awarded to persons making scientific contributions in the field.



**Amtico Travertine Vinyl (*top*), Amtico Textura Large Mosaic (*middle*), and Amtico Textura Moire (*bottom*) were recently awarded the only Citation of Merit award for hard surface flooring of the American Institute of Decorators for 1960. Products of the Amtico Flooring Division of American Biltrite Rubber Co., Trenton, N. J., their design is the work of Mrs. Natalie S. Marcus, stylist and director of the company's decorator-design division, who received the award. Mrs. Marcus is the wife of Robert G. Marcus, vice president and general manager of Amtico Flooring Division. Amtico was similarly honored by A.I.D. in 1959 for its Floor-Mate Originals, which were also designed by Mrs. Natalie Marcus**

# news briefs

**PHILLIPS PETROLEUM CO., Bartlesville, Okla., will construct a plant to produce high-purity benzene** at its Sweeny refinery south of Houston, Tex. Plant capacity is estimated at 22 million gallons a year. Benzene shipments are scheduled to begin by mid-1961.

**MICHIGAN CHEMICAL CORP., St. Louis, Mich., has acquired the anhydrous hydrogen bromide manufacturing facilities** at South Charleston, W. Va., formerly owned and operated by the Westvaco Chlor-Alkali Division of Food Machinery & Chemical Corp. The facilities have been moved to the St. Louis plant.

**FRITZSCHE BROTHERS, INC.,** New York, N. Y., has taken in the ninetieth member of its Quarter of a Century Club, composed of employes who have been with the firm for 25 years or more. The new member, Bryan J. McCabe, joined the company in 1935. The firm will soon celebrate its ninetieth anniversary.

**AVISUN CORP. will move its executive offices** to the Philadelphia National Bank Building, Philadelphia, Pa., about December 1. The firm, equally owned affiliate of American Viscose Corp. and Sun Oil Co., is now located in Marcus Hook, Pa.

**REEVES BROTHERS VULCAN coating plant in Buena Vista, Va., has been given the Honor Award** of the National Safety Council, awarded to plants which have recorded more than three million manhours of work without loss of work time due to injuries. In the case of the Reeves Brothers plant this meant a total of more than four years without a lost-time accident, from May, 1956, to July, 1960.

**JEFFERSON CHEMICAL CO. held an open house on October 27 to celebrate completion of a new plant** at Conroe, Tex. The unit produces polypropylene glycol and propylene oxide triols, chemicals used in the manufacture of rigid and flexible polyurethane foams. Other products made at the plant include rubber curing agents, morpholine, corrosion inhibitors, and specialty surface active agents.

**BORG-WARNER CORP., Chicago, Ill., through its Spring Division has acquired Brummer Seal Co.,** Chicago Heights, Ill., manufacturer of mechanical seals for automotive engines, water pumps, and similar applications. The firm will be known as the Brummer Seal Division of Borg-Warner Corp., but will be operated as part of the Spring Division.

**GOODRICH-GULF CHEMICALS is constructing facilities for commercial production of Ameripol polyethylene** at its plant in Port Neches, Tex. The process and plant design were developed by Goodrich-Gulf from the Ziegler activated-catalyst system.

In this new procedure for testing abrasion resistance of rubber samples, B. F. Goodrich Co. scientists scrape a rubber sample mounted on this turntable with diamond-honed tungsten carbide blades. Company scientists say that results correlate closely with actual performance of these rubbers in road-tested tires, unlike the standard laboratory tests for tread wear of tires. The device, being used at the company's Brecksville, O., research center, evaluates both abrasion resistance in different rubbers and differences in resistance in the same rubber using different kinds of carbon blacks as reinforcers.

**THE GOODYEAR TIRE & RUBBER CO. is expanding its Chemigum (nitrile) rubber and its nitrile and SBR latex facilities** at Akron, O. The \$1¼-million project involves enlargement of storage and production facilities and purchase of new equipment, providing an expected 15% capacity increase.

**FIRESTONE TIRE & RUBBER CO. has developed an all-butyl rubber tire** with quick-stopping ability and a smooth, silent ride. The tire, the Butyl-aire, is the first all-butyl passenger tire to be offered by any of the major rubber companies. It has a nylon cord body.

**CONNECTICUT HARD RUBBER CO., New Haven, Conn., has formed an electrical product department,** with an electrical marketing group to service users in the fields of rotating equipment and wire and cable. In addition, manufacturing facilities at the New Haven plant have been expanded to include a complete line of silicone rubber electrical tapes, including cured, semi-cured, and self-bonding tapes, both supported and unsupported.

**CARWIN CO. has announced a reduction in the price of PAPI®** (polymethylene polyphenylisocyanate) from \$2.25 to \$1.50 a pound in drum lots.

**STAUFFER CHEMICAL CO. has brought on stream** at its Anderson Chemical Division, Weston, Mich., a new plant for production of ultra-pure titanium trichloride. The plant has a capacity of 500,000 pounds a year.

**UHRDEN, INC., Dennison, O., has appointed Power Items, Inc.,** Brooklyn, N. Y., exclusive distributor of Tubar materials handling equipment for the Metropolitan New York area. The Tubar line of equipment includes custom-engineered unloaders, dumpers, work positioners, lifts, and cranes.

**RODNEY HUNT MACHINE CO., Orange, Mass., has introduced the Aquatrol® Expander,** a bow expander roll working on a new principle. The roll, used in textile and paper mills, has one moving part, a rotating rubber sleeve floating on a film of water.

*(Continued on page 132)*

# news about people

R. J. Burns

H. J. Lafaye

N. C. Wheeler

S. A. Fruchtman

**Frank E. Bell** and **Doran E. Sauser** have been promoted from Hycar sales representatives to area marketing representatives. Bell, assigned to the Cleveland sales office, and Sauser, assigned to New York, will continue to handle field sales and technical assistance, but will add the responsibility of office management in their areas.

**Robert J. Burns** succeeds **H. J. Lafaye** as general manager of the metal products division, The Goodyear Tire & Rubber Co., Akron, O. Lafaye has retired as head of the division. Burns was his assistant general manager since 1957.

**W. P. Schwager** becomes manager of service compounding, technical service, and the experimental workshop in the development department, The Firestone Tire & Rubber Co. He leaves the post of manager of the technical service department at the Los Angeles, Calif., plant to take up his new position in Akron, O. **K. W. Brandeau,** formerly manager of development compounding, now assumes added responsibilities as manager of physical testing and the analytical laboratory.

**Robert Watkins** has been made general products sales manager to cover Ohio, Michigan, and western Pennsylvania for Flexible Tubing Corp. and will have his headquarters in Cleveland, O. **Raymond J. Love** is now plant manager of the company's Guilford, Conn., plant.

**Norton C. Wheeler, Jr.,** newly appointed research and development manager of Davis-Standard, division of Franklin Research & Development Corp., Mystic, Conn., will direct his work primarily toward the development of high-production systems for all types of plastics extrusion. He was a sales engineer with Davis-Standard for 12 years.

**S. A. Fruchtman** is now chief engineer for Crawford & Russell, Inc., Stamford, Conn., and will have broad supervisory and management responsibilities for all the firm's projects. Previously Fruchtman served as the company's chief design engineer.

**Earl W. Scott** fills the new post of market development manager for latex and coatings, Marbon Chemical Division, Borg-Warner Corp., Washington, W. Va. The position was created to handle growing market activities for new products developed for latex and coating. Scott was development coordinator for latex and coatings, and he has a background of more than 16 years in the field.

**H. A. Captein,** as senior sales representative for the San Francisco, Calif., field office of The Goodyear Tire & Rubber Co.'s chemical division, will handle sales and service of the division's synthetic rubber, vinyl resins, and rubber chemicals.

**Harold G. Shelton,** vice president and group executive in charge of the three divisions recently organized from the former Dyestuff & Chemical Division, General Aniline & Film Corp., New York, N. Y., has announced the heads of the three new divisions. **C. C. Schulze,** formerly assistant general manager of the Dyestuff & Chemical Division, is now head of Antara Chemicals Division. **Joseph W. Conlon,** director of manufacturing for the old D & C Division, is now in charge of the new General Dyestuff Division. **Robert J. O'Brien,** formerly in charge of the pigments department, now heads the Collway Pigments Division.

**Norman A. Klemp,** recently appointed vice president of Pacific Moulded Products Co., Los Angeles, Calif., will also continue as plant manager.

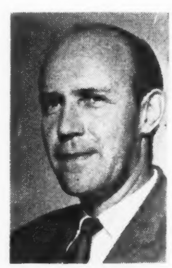
**J. M. Thompson** is the new general manager, Canadian Lastex, Ltd., Montreal, P.Q. For the past three years assistant general manager, he has more than 28 years' experience in the industry.

**Arthur V. Krone** has been appointed general traffic manager, United Carbon Co., Inc., New York, N. Y.

**Lawrence D. Stoddard** has been assigned as sales representative for the east central district, silicone products department, General Electric Co., and will have an office in Cleveland, O.

E. W. Scott

H. A. Captein



N. A. Klemp

L. D. Stoddard

Neil B. Roberts succeeds S. C. Kilbank as area sales manager, Europe, for Polymer Corp., Ltd. Roberts was technical sales representative in London, England, since 1956. Kilbank has been assigned to a special project.

**William A. Suiter** and **Miss Rhoda M. Stewart** have been named vice presidents of Marbon Chemical Division, Borg-Warner Corp., Washington, W. Va. Suiter, who has been Cyolac resin sales manager since 1958, will now be responsible for all sales activities. Miss Stewart has served as director of purchases, recently added the traffic department to her responsibilities, and will now also be in charge of the personnel department.

**M. E. Pickett, Jr.,** is now a vice president of Columbian Carbon (Canada) Ltd., Hamilton, Ont., Canada, and a general manager of its carbon black and pigment division.

**Kenneth H. Barratt** becomes regional sales manager for the northeastern area of this country for International Latex Corp. He will establish an offiice near Boston, Mass., in the near future. Barratt was recently with the Naugatuck Chemical Division, United States Rubber Co., and has had almost ten years' experience in various aspects of the latex field.

**C. Robert Geiser,** new manager of product development for the industrial chemicals division, Pennsalt Chemicals Corp., Philadelphia, Pa., will be responsible for developing new markets and new uses for existing products, as well as for analyzing market potentials. **Robert O. Rowe** replaces Geiser as product manager and will supervise sales for various chemical products.

**Clyde D. Segner** becomes technical service manager for the international sales department, B. F. Goodrich Chemical Co., Akron, O. He succeeds **Paul E. Ditto,** now technical service manager of B. F. Goodrich-C.S.R. Chemicals, Pty. Ltd., a recently established Australian company.

**Edwin M. Irish,** formerly product manager, polymer, has been made manager of sales, while **E. T. Severs,** formerly product manager, film, has been named manager of market development, two new positions in Avi-Sun Corp., Marcus Hook, Pa. **James C. Warren** is now sales manager, polymer.

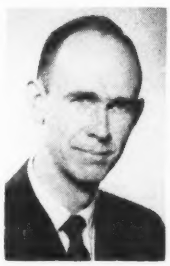
**J. M. Montefalco** has been named general manager of manufacturing at the Shelton, Conn., Sponge Products division of The B. F. Goodrich Co.

N. B. Roberts

T. D. Cabot, Jr.

J. F. O'Haren

C. W. Vaughan



K. H. Barratt

D. M. Alstadt

C. D. Segner

H. C. Crosland

**Howard C. Crosland** has joined Chemical Rubber Products, Inc., Beacon, N. Y., as vice president and will manage all phases of finished parts production.

**Edward W. May** is now eastern district manager for Naugatuck Chemicals, division of Dominion Rubber Co., Ltd., Montreal, P.Q., Canada, and will take charge of sales of all the company's products in eastern Ontario, Quebec, and the Atlantic provinces.

**Thomas D. Cabot, Jr.,** has been elected president of Texas Butadiene & Chemical International, Ltd., Hamilton, Bermuda. **James F. O'Haren,** European commercial manager, will supervise the new branch office in Lausanne, Switzerland. **C. Wheaton Vaughan,** recently appointed assistant director, development department, is responsible for the company's European technical and development activities. TBCL is a wholly owned Canadian subsidiary of Texas Butadiene & Chemical Corp., New York, N. Y., and is presently engaged in the overseas sale of butadiene and synthetic rubber.

**L. H. Coffin** has been appointed assistant to the vice president of Goodyear International Corp., Akron, O. **W. E. Forster** succeeds him as production manager, Western Hemisphere; while **M. F. Gillespie** becomes production manager of Europe and Asia; and **M. A. Ryan,** production manager of the Far East and Australasia.

**Harry M. Caruthers** moves to Memphis, Tenn., to become district sales manager, tire division, for The Goodyear Tire & Rubber Co. **Lawrence J. Beckman** succeeds Caruthers as Detroit district sales manager; while **Earl V. De Graw** takes Beckman's place as district sales manager, Minneapolis, Minn.

**Donald M. Alstadt** has been appointed vice president of Hughson Chemical Co., Erie, Pa., a division of Lord Mfg. Co. He has served as manager of Hughson since its formation in 1959 and has also been manager of central research for Lord during the past four years.

**K. Byard,** now vice president and general manager, industrial products division, Dunlop Canada, Ltd., Toronto, Ont., is responsible for the division's operations. **J. Simon** has been named general manager of the automotive division and has been elected a director of the company.

**Frank Vilim** moves from the marketing division, Polymer Corp., Ltd., at Sarnia, Ont., Canada, to Vienna, Austria, to join **Peter Mayer** as technical service representative. **John Spehar** goes to the London, England, office, as technical service and sales representative.

**James H. Joyner** moves to Honolulu to become manager, Hawaiian sales, for H. K. Porter Co., Inc. In that capacity he will represent all Porter divisions in Hawaii and will be responsible for both sales and service of products. Most recently he was western regional sales manager of the Thermoid Division.

## news about people

**Waldo L. Semon,** director of rubber research for The B. F. Goodrich Co., Akron, O., has received the Distinguished Award of Council from the Akron Council of Engineering & Scientific Societies for his long and distinguished career in chemical research.

**Frank J. Kilrain,** newly appointed sales manager of the central region for the Cardox Division, Chemetron Corp., producer of liquid carbon dioxide, carbonic gas, and dry ice, will make his headquarters in Detroit, Mich.

**Leon Talalay** has been appointed technical director of the Sponge Products division, The B. F. Goodrich Co., at Shelton, Conn. He was technical director of the Texfoam section of the division.

**A. D. Veale,** new Midwest district sales manager, Catalin Corp. of America, will cover the Midwest from his headquarters in Chicago. He will continue to supervise the Michigan-Ohio area which he formerly served.

**Joseph W. Brown** has been appointed field sales representative with headquarters in Los Angeles for Geigy Industrial Chemicals. He will cover California, Nevada, Utah, Arizona, and Colorado.

**William Long** has joined Pacific Moulded Products Co., Los Angeles, Calif., as technical director in charge of research and laboratories.

**Bradford Champion** has joined the staff of Vulcan Rubber Products Division, Reeves Brothers, Inc., New York, N.Y., with the assignment of developing products and applications for the company's rubber coated and plastic coated fabrics.

**Paul D. Bowers** holds the newly created position of chief chemist for all North American tire plants of The Firestone Tire & Rubber Co., Akron, O., and will head all tire plant laboratories in the company's plants in this country and Canada. .

**Thomas A. Marshall, Jr.,** has been elected executive secretary of the American Society for Testing Materials, Philadelphia, Pa. **Fred F. Van Atta,** formerly assistant secretary, is now treasurer.

**A. R. Rutan** has joined Ware Chemical Corp. and will devote most of his time to technical service. He was formerly with the technical sales department, Thiokol Chemical Corp.

Bramac Studio

R. O. Babbit

Haviland

O. B. Samler

**O. B. Samler** has been transferred from R. T. Vanderbilt Co., New York, N. Y., to serve as manager of Vanderbilt Export Corp., New York. His wide experience in the rubber industry includes four years in Vanderbilt's administrative sales office. **R. O. Babbit** assumes the technical sales and service duties formerly handled by Samler. Babbit has been a technical sales representative for the past 20 years.

**Murray C. Bartlett** has been named general manager, rubber products manufacturing, B. F. Goodrich Aviation Products. Since 1957 he was manager of product engineering for Aviation Products.

Herman Muehlstein, H. Muehlstein & Co., Inc., *(left)*, was honored at the first annual dinner of the newly formed Plastics & Allied Industries Division of the United Jewish Appeal for his efforts in organizing the group and his outstanding contributions to UJA work over the years. The dinner was held at the Plaza Hotel, New York, N. Y., September 28, with Fred S. Strauss, Harte & Co., Inc., *(right)*, acting as chairman for the affair. Contributions totaling $250,000 for the 1960 relief and resettlement campaign of UJA were announced.

**J. E. Leehey** and **D. J. Voss** have joined the sales staff of Jefferson Chemical Co., Inc., Houston, Tex. Leehey will cover the southern region; Voss the eastern.

**James J. Hanks** is the Washington, D. C., sales representative for Presray Corp., a subsidiary of Pawling Rubber Corp.

**James S. J. Berray** and **Robert L. Daileader** have been named sales representatives for the silicone products department, General Electric Co. Berray will cover the eastern district and will make his office in Drexel Hill, Pa. Daileader's will be in Bridgeport, Conn.

**James E. Ingram,** former factory manager of Jasper Rubber Co., Jasper, Ga., has been elected vice president and general manager as well as a member of the board of directors. **Dana D. Hazen** has also been elected a director and is now vice president in charge of customer relations.

**George F. Polzer** has been promoted to vice president in charge of purchasing, transportation, and customer relations for Witco Chemical Co., Inc. He will be stationed in the New York, N. Y., office to direct these activities for all Witco's divisions.

**R. B. Hazard,** vice president and sales manager, rubber and packings, for Raybestos-Manhattan, Inc., Passaic, N. J., has been elected a director.

**Charles E. Craft** is now a field representative in the West Texas and New Mexico area for Republic Rubber Division, Lee Rubber & Tire Corp. His headquarters are in Midland, Tex.

**Walter J. Baird** is now Los Angeles, Calif., area sales representative for the sundries division of B. F. Goodrich Industrial Products Co., after having been a division sales correspondent.

**Philip T. Rogers** is now vice president and general manager of the ARco-Wynn valve division, Automotive Rubber Co., Detroit, Mich.

**William F. Grobe** is direct sales representative serving Michigan, northern Indiana, and Ontario, Canada, for J. H. Day Co. He will be located in the company's Livonia, Mich., office.

**Anselm DeGhetto** is now president of Getty Machine & Mold, Inc., Clifton, N. J. He was formerly vice president of National Rubber Machinery Co. and manager of its Clifton division.

# obituaries

## Robert Abbott

Robert Abbott, retired president of Raybestos-Manhattan (Canada), Ltd., Peterborough, Ont., Canada, died October 9 after a long illness.

He joined the Raybestos Co. (now the Raybestos Division, Raybestos-Manhattan, Inc.), Bridgeport, Conn., in 1918. Shortly after, he helped organize the Canadian plant which began operations in 1920. He became its first manager and saw it become a sizable operating unit. In 1937 he was made a director of Raybestos-Manhattan, Inc.; in 1941 he was named executive vice president of the Canadian corporation and in 1953 its president. He retired in 1956, but remained an active director until his death.

Mr. Abbott was born 73 years ago in Plainfield, N. J. After his graduation from Yale University in 1908 he taught mathematics for one year and later worked for Bryant Electric Co., Bridgeport. He also served with the army during World War I.

The deceased was a member of the Canadian Section of the Society of Automotive Engineers and past chairman of the Peterborough branch of the Canadian Manufacturers Association. He was also known as an outstanding amateur golfer and was active in civic affairs.

Services were held in St. Paul's Presbyterian Church, October 12, and burial followed at Little Lake Cemetery.

Surviving him are his wife, two daughters, five grandchildren, and a sister.

## Carl A. Bartle

Carl A. Bartle, retired official of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., died at his home in Sarasota, Fla., September 29, following a heart attack.

Well known in the rubber industry, Mr. Bartle, often called "Cabby," retired last November after a 37-year career with the company.

He joined Du Pont in September, 1918, after having worked two years as research engineer for Aluminum Co. of America. He began as a chemist at Du Pont and later the same year became a production supervisor at the

Willard Stewart, Inc.

Carl A. Bartle

Repauno plant, Gibbstown, N. J. He left in 1919 to become a chemical supervisor of production for National Aniline & Chemical Corp., Marcus Hook, Pa.

Mr. Bartle returned to Du Pont in 1923 and was assigned to the New York sales office of what was then the dyestuffs department. In 1925 he was transferred to the Chicago, Ill., district sales office and in 1929 became assistant sales manager for rubber chemicals at Wilmington.

In 1932, Mr. Bartle was made sales manager of what is now the elastomer chemicals department, and in 1943 he was made its sales director. He held that position until 1958, when he was named a special assistant, pending his retirement.

The deceased was born November 13, 1894, in Philadelphia, Pa. He received his B.S. degree in electrochemical engineering from Pennsylvania State College in 1916.

He was a member of Phi Kappa Phi and Theta Chi. A past chairman of the New York Rubber Group, he was also a member of the Buffalo, Boston, Chicago, and Philadelphia Rubber groups, and of the Division of Rubber Chemistry, American Chemical Society.

Requiem Mass was said October 5 at St. Mary's Catholic Church, with interment in Holy Sepulchre Cemetery, both in Manayunk, Pa.

Surviving are his wife, a sister, and three brothers.

## CALENDAR

November 16
Quebec Rubber & Plastics Group. Joint Meeting with Montreal Section, CIC.

November 18
Connecticut Rubber Group. Rapp's Paradise Inn, Ansonia, Conn.
Chicago Rubber Group. Furniture Club, Chicago, Ill.
Rubber Chemical Salesmen's Association of Akron. Yanko's Restaurant, Akron, O.

November 22
Manufacturing Chemists' Association. Tenth Semi-Annual Meeting and Midyear Conference. Statler-Hilton Hotel, New York, N. Y.

November 30-December 1-2
U. S. Army Signal Research & Development Laboratory. Ninth Annual Symposium on "Technical Progress in Communication Wires and Cables." Berkeley-Carteret Hotel, Asbury Park, N. J.

December 2
The Los Angeles Rubber Group, Inc. Christmas Party. Cocoanut Grove, Los Angeles, Calif.

December 3
Northern California Rubber Group. Christmas Party.

December 9
Detroit Rubber & Plastics Group, Inc. Christmas Meeting. Statler-Hilton Hotel, Detroit, Mich.

December 10
Southern Ohio Rubber Group. Christmas Party. Miami Valley Golf Club, Dayton, O.

December 13
Buffalo Rubber Group.

December 16
New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Christmas Party. Somerset Hotel, Boston, Mass.
Chicago Rubber Group. Christmas Party and Ladies Night. Morrison Hotel, Chicago, Ill.

January 19
Quebec Rubber & Plastics Group.

January 20-21
Southern Rubber Group. Statler-Hilton Hotel, Dallas, Tex.

January 27
Akron Rubber Group.
Chicago Rubber Group. Furniture Club, Chicago, Ill.

*(Continued on page 146)*

# news from abroad

# Malaya Plays Host To Three Rubber Conferences in September

Malaya was the scene of unusual activity during September, when about 300 personalities of the rubber world arrived to attend three important rubber conferences, held consecutively.

## Packing and Quality

At the Third International Rubber Quality and Packing Conference held in Singapore, September 12-16, it was agreed to replace 12 overlapping Singapore and RMA rubber grades by ten new International Standard grades. These are:

(1) International 4, 5, and 6, Ribbed Smoked Sheet (eliminating former #4 and 5 RSS and Singapore 4 and 5 RSS).

(2) International 2, 3, and 4 Clean Thick Blanket Crepe (eliminating former RMA 3 Amber or Clean Thick Blanket Crepe and the Singapore C Thick Remilled Blanket Crepe).

(3) International 1, 2, 3, and 4 Clean Thin Brown Crepe (eliminating RMA 2, 3, and 4 Clean Thin Brown Crepe and Singapore 2, 3, and 4 Thin Brown (remilled) Crepe).

They will go into effect probably in the spring of next year.

The new grades are acceptable to producers and consumers alike since they eliminate the confusion caused by overlapping standards: there can now be no doubt as to what a grade means. Singapore rubber dealers also welcomed the agreement in the expectation that it will lead to healthier trade.

The new standards are to be published in the Green Book, which will also list—with suitable descriptions—air-dried sheet, sheet made with additives, skim rubber, Technically Classified rubber, SP rubbers, and certain other material.

Among the products to be listed in the Green Book is sheet prepared with the Maclai Patent Coagulant, use of which eliminates the need of smoking. It was invented by David McCall in 1950 when he was an estate manager in Johore, but it was not commercially produced until 1957. The sheet made with it is said somewhat to resemble smoked sheet in appearance and is understood not to be inferior technologically and to have good mold resistance. The smallholder, in particular, is expected to benefit by the new method since it will enable him to produce a better grade of rubber. Already the coagulant is being used in British Borneo as well as in Malaya; the United States and some other countries are said to be showing interest in "Maclai" sheet.

## IRS Meeting

Delegates and observers from 20 different countries attended the fifteenth meeting of the International Rubber Study Group held September 19-23 in Kuala Lumpur. In his opening speech the Prime Minister, Tengku Abdul Rahman, recalled that in 1948 the sixth meeting of the Group was to have been held in Malaya, but that the war against communist terrorism in the Federation had prevented this. Discussing the importance of the rubber industry for the economic and social development of Malaya, he pointed out that: nearly 65% of the total cultivated area here is planted with rubber; 60% of Malaya's foreign exchange earnings comes from rubber exports; one-third of the government revenue is from export duty on rubber and taxes on profits of the industry; and that consequently "a reasonable degree of stability in the production, trade, and price of natural rubber is of the utmost concern to us."

The expansion of synthetic rubber and the development of new and improved types were also matters of deep concern to rubber growers, who therefore are now embarked on a vigorous program of research and development to meet this challenge.

These points were further emphasized in a Federation Government Memorandum to the Group which also gave details of rubber production; it showed that the average rate of increase in output over the six-year period 1953-1959 works out at roughly 4% annually. The biggest increase was 9% in 1954-1955; in 1957 the increase was 2%, but rose again to 4% in 1958 and 6% in 1959. An even greater increase is looked for after 1963; for by 1965 the proportion of high-yielding material is expected to exceed 60% of the mature acreage. Table 1 gives outputs on estates and smallholdings in the years 1957-1959 and in the first half of 1960, in long tons.

The increase in smallholder production in 1959—17,100 tons from 1,500,000 acres of smallholdings, as compared with the increase of 18,300 tons from estates covering some 2,000,000 acres—clearly reflects the greater influence of high prices on smallholder activity.

The Group considered the question of price stabilization, and it was felt that in the long term the new stereoregular synthetic rubbers would have an important stabilizing effect on natural rubber price levels. In the short term, a significant contribution to the reduction of excessive fluctuations could be made by such measures as more accurate and more widely disseminated statistics and information of scientific and technical developments, and trends of production and consumption of natural and synthetic rubber. These measures and any other proposals submitted by member countries are to be studied by the management committee.

World rubber consumption in 1960 is put by the Group at 2,070,000 long tons of natural rubber and 1,770,000 long tons of synthetic rubber, not including the synthetic rubber produced by non-member countries. World production is estimated at 2,055,000 long tons of natural rubber and 1,940,000 long tons of synthetic rubber; with about 160,000 tons of natural rubber

Table 1. Rubber Output in Long Tons

| | 1957 | 1958 | 1959 | First Half, 1960 |
|---|---|---|---|---|
| Estates | 368,600 | 390,100 | 408,400 | 194,000 |
| Smallholdings | 268,900 | 272,700 | 289,800 | 141,000 |
| Total | 637,500 | 662,800 | 698,200 | 335,000 |

delivered from government stockpiles, there should be a surplus of 145,000 tons of natural and 170,000 tons of synthetic rubber, which the Group concludes will enable commercial stocks to be rebuilt to more normal levels appropriate to the increased world consumption.

The rubber grower could get a very good idea of the widespread use of synthetic rubber and the considerable gains it has made in some countries from the Group's estimates of 1960 consumption, shown in Table 2.

TABLE 2 WORLD RUBBER CONSUMPTION IN 1960

(In Long Tons)

| | Natural | Synthetic | Total |
|---|---|---|---|
| United States | 506 | 1,114 | 1,620 |
| United Kingdom | 170 | 110 | 280 |
| Federal Republic of Germany | 145 | 95 | 240 |
| France | 128 | 88 | 216 |
| Japan | 161 | 48 | 209 |
| Italy | 69 | 46 | 115 |
| Canada | 40 | 60 | 100 |
| Australia | 40 | 20 | 20 |
| Czechoslovakia | 52 | *2 | 54 |
| Netherlands | 21 | 11 | 32 |
| Belguim | 15 | 11 | 26 |
| Austria | 11 | 7 | 18 |
| Denmark | 6 | 3 | 9 |
| Hungary | 7 | *1 | 8 |
| Other countries | 699 | 154 | 853 |
| Total | 2,070 | 1,770 | 3,840 |

*Excluding rubber produced in non-member countries.

The next meeting of the International Rubber Study Group will take place in 1962, in Washington.

## Rubber Research Conference

Only some of the topics can be mentioned that were discussed at the very successful Rubber Research Conference held in Kuala Lumpur, September 27-October 1, since it would be useless to attempt in the limited space available anything like the comprehensive review of the 76 papers presented at its close by the Controller of Rubber Research, Sir Geoffrey. The range of topics was indeed very great, as Sir Geoffrey said, adding Professor Bonner's remark, that there can be few industries whose research organizations need a wider spectrum of scientific knowledge than does the rubber industry.

Prof. James Bonner, of California Institute of Technology, was one of the three guest speakers at the general sessions; the other two were Prof. G. E. Blackman, of the University of Oxford, and Prof. G. Gee, of the University of Manchester.

Professor Blackman chose as his subject, "The Stimulation of Latex Flow by Plant Regulators." He reviewed the development of methods and results achieved more particularly by the hormone treatment discovered in Malaya four years ago. By this method of hormone treatment, over a four-year period, "a mean gain of 200 pounds per acre is a conservative figure," he stated. The total additional yield in Malaya, over the same period, he estimated at 68,400,000 pounds, representing a value of $63,000,000 (Straits). Even if totals are halved, he added, "this is still a very handsome return on the money spent on research."

Professor Gee, speaking on "New Methods of Elastomer Synthesis and Their Impact on Natural Rubber," made the points, among others, that: there is no present evidence that a material essentially identical with natural rubber can be made synthetically at a price too low to be matched by the grower; and that natural rubber can no longer be considered a unique material, but is a typical (though outstandingly good) member of a family of elastomers. He also dealt with the possibilities of modifying natural rubber and of blending it with synthetic rubber.

Professor Bonner discussed "The Biosynthesis of Rubber," giving a general review of the subject; and stating his views on future research in this field, he foresaw interesting new possibilities for natural rubber in new directions.

The other papers were presented at two concurrent sessions—one dealing with the production of natural rubber, and the other with research on latex and the preparation of rubber. Problems of growth, propagation, manuring, health, and tapping of *Hevea* were discussed. Of special interest were a report on techniques for the successful rooting of leafy cutting of various *Hevea* clones; a new intensive method of tapping old trees; leaf and latex analyses to determine manuring requirements.

Several papers were devoted to fundamental research on latex and the production of modified rubbers; there were studies: on the non-rubber constituents in latex and the reactivity of the hydrocarbon in latex; on bacterial action in the tree, latex contamination and research to discover whether the trees have their own defense mechanism against bacteria. A new theory of the cause of hardening of rubber in storage was reported which serves as the basis for a satisfactory method to prevent it. Further work in Malaya on SP rubbers had led to the discovery of other methods of imparting Superior Processing characteristics, which are intended chiefly for applications where ease of processing and economy are of primary importance, and quality takes second place. Interesting work in Vietnam on masterbatching was reported.

## Pelletized News

**A dehydrogenation unit designed by Houdry Process Corp.,** Philadelphia, Pa., went on stream in August at ANIC of Italy in Ravenna. The unit, designed to produce 20,000 short tons of butadiene a year, is located on the same site as the ANIC synthetic rubber plant.

**The Japanese Government has approved a joint venture** between E. I. du Pont de Nemours & Co., Inc., and Showa Denka of Japan to produce neoprene in that country. The joint subsidiary, Showa Neoprene, capitalized at $9.7 million, is slated to produce 8,000 tons of neoprene a year at a plant in Kawasaki. To increase production beyond that rate, the company would need further government approval.

**George B. Longan** has been named managing director of The Firestone Tire & Rubber Co. plant in Buenos Aires, Argentina. He was formerly a division sales manager for Firestone International Co.

**Jack B. Burns** has moved to Melbourne, Australia, to become factory manager of B. F. Goodrich Australia, Pty. Ltd. He was production superintendent of the Akron, O., tire plant. **Harold R. McKeighen,** general foreman of tire curing, will assist in production at the new Australian subsidiary.

**General Kinetics Corp., Englewood, N. J., has licensed Elliott-Automation Ltd.,** London, England, to manufacture the P-K Paul valve and distribute it throughout Europe, the Middle East, and the British Commonwealth, except for Canada. In return, General Kinetics was appointed distributor for the complete line of Black automatic controls manufactured by Elliott-Automation.

**Goodyear Tire & Rubber Co. formally opened on October 27 a new $7-million plant** at Amiens, France, to produce tires and tubes for domestic and export markets. F. T. Magennis and R. V. Thomas, president and vice president, respectively, of Goodrich International Corp., attended the plant dedication.

**Owners of small estates in Malaya** who have failed to take advantage of the government's replanting program were warned to act quickly or face possible loss of their properties. Inche Mohamed Khir Johari, Malayan Minister of Commerce and Industry, said that 616 estate owners having from 100 to 500 acres of land have not taken advantage of the replanting inducements the government has offered.

"I am wondering whether in such cases it might not be more in the national interest for titles to these estates to be withdrawn and given instead to those who are willing and able to do the replanting," Johari said.

# market reviews

# Natural Rubber Prices Fall Slowly; Tyrex Cord Prices Edge Up Again

## Natural Rubber

Prices of natural rubber continued to fall slowly during the September 16-October 15 period, and several changes in tire marketing patterns are likely to produce even lower prices in the next few months.

Chief among them is the great popularity of so-called third-line tires being manufactured and promoted strongly by several major producers. These lower-priced tires both are lighter than standard tires, with a consequently lower rubber content, and have a larger percentage of reclaim to new rubber than is usual. This practice means more business for reclaimers, but less demand for new rubber of both the natural and synthetic varieties.

Another factor is the trend toward the compacts. Compact cars accounted for more than 26% of all new cars registered in August, with the big sales push on compacts expected to produce an even higher proportion of compacts next year.

The switch here is toward lighter tires for the compacts, particularly two-ply tires. There is also a trend toward high-grade lighter tires for high-speed driving, on grounds that they dissipate heat better and are therefore not so susceptible to heat aging as conventional tires. With an increase in the number of high-speed turnpikes, this is having an effect on buying patterns.

The International Rubber Study Group, at its meeting in Kuala Lumpur, Malaya, in late September, estimated that the world will produce more rubber than it will consume this year, a surplus of 145,000 long tons of natural rubber and 170,000 long tons of synthetic rubber. The announcement had an immediately depressing effect on market prices, and expectation of the surplus is expected to continue to keep prices down.

The estimate of the International Rubber Study Group was for consumption of 2,070,000 long tons of natural rubber and 1,770,000 long tons of synthetic rubber. It estimated that world production of natural rubber would be 2,055,000 long tons, with another 160,000 long tons delivered from government stockpiles, and production of synthetic rubber was figured at 1,940,000 long tons.

On the other hand, Clarence W. Thorp, marketing manager of the Goodyear Tire & Rubber Co.'s tire division, argued in a statement recently that the switch to compacts is producing a rapid increase in the number of two-car families, and that the increased number of two-car families and increasing automobile mileage generally, about 250 billion miles between now and 1971, will boost demand. This factor will probably keep prices from falling too far.

In the long run, the factor likely to produce lower prices for natural rubber is the drive on the part of rubber producers to increase yield of trees and so cut costs enough to enable them to compete with prices of synthetic rubber. W. E. Klippert, general manager of Goodyear's plantation division, said recently that production increases will produce competitive prices for natural. High-yield trees now being planted in many rubber producing areas have a potential yield of 2,000 to 3,000 pounds of rubber per acre. This would mean a production cost of only 25% of that from trees with a yield of 350 pounds per acre, and perhaps about half that from 800 pounds per acre tree yields. The yield in Malaya is expected to jump from about 700 pounds to three or four times that amount in the next 10 to 15 years, according to Malayan officials.

Prices fell approximately a cent and a half over the September 16-October 15 period. With the downward trend so slight, it was almost obscured by day to day fluctuations, but essentially the market lacks strength. The seemingly unlikely prospect of massive Russian buying would spur a rise. Terrific sales for the 1961 cars over the next few months might also push prices up. On the other hand, with much of the sales expected to be in compacts, high sales might have little effect.

September sales on the New York Commodity Exchange totaled 10,790 long tons, compared with 9,600 during August. There were 21 trading days in September and the same number in the September 16-October 15 period.

On the physical market, according to the Rubber Trade Association of New York, RSS #1 averaged 34.93¢ a pound for September, compared with 36.78¢ in August, and 35.17¢ for the September 16-October 15 period. Average September sellers prices were RSS #3, 33.11¢; Amber Blankets, 27.69¢; and Flat Bark, 23.60¢.

REX CONTRACT

| 1960 | Sept. 16 | Sept. 23 | Sept. 30 | Oct. 7 | Oct. 14 |
|---|---|---|---|---|---|
| Sept. | 35.65 | 34.30 | | .... | .... |
| Nov. | 35.55 | 34.85 | 35.10 | 34.10 | 34.00 |
| 1961 | | | | | |
| Jan | 34.65 | 33.65 | 34.00 | 32.76 | 32.60 |
| Mar. | 34.15 | 33.10 | 33.40 | 32.31 | 32.15 |
| ~~May~~ | 33.75 | 32.60 | 33.00 | 32.00 | 31.90 |
| July | 33.50 | 32.35 | 32.70 | 31.80 | 31.65 |
| Sept | 33.25 | 32.00 | 32.50 | 31.70 | 31.55 |
| Nov. | .... | .... | 32.20 | 31.30 | 31.10 |

NEW YORK OUTSIDE MARKET

| | Sept. 16 | Sept. 23 | Sept. 30 | Oct. 7 | Oct. 14 |
|---|---|---|---|---|---|
| RSS #1 | 36.00 | 35.50 | 36.00 | 34.50 | 34.38 |
| #2 | 35.75 | 35.25 | 35.75 | 34.25 | 34.25 |
| #3 | 35.63 | 35.13 | 35.63 | 34.13 | 34.13 |
| Pale Crepe #1 Thick | 38.00 | 37.25 | 37.75 | 36.38 | 35.85 |
| Thin | 38.00 | 37.25 | 37.75 | 36.75 | 36.38 |
| #3 Amber Blankets | 29.50 | 29.50 | 30.00 | 29.75 | 29.25 |
| #3 Thin Brown Crepe | 29.50 | 29.25 | 29.75 | 29.50 | 29.13 |
| Standard Flat Bark | 23.75 | 24.00 | 24.50 | 24.25 | 24.00 |

## market reviews

### Rayon and Nylon

Producers of rayon and viscose Tyrex tire yarn raised prices of 1100 denier yarn ½¢ and prices of 1650 and 2200 denier yarns 1½¢ on October 15 to cut the squeeze on sales and earnings.

American Enka started the move by announcing the price increases, and all other rayon yarn producers followed the move.

The increase in prices was not expected to alter the balance in the competition between rayon and nylon, since prices of rayon are still lower than nylon tire yarn prices. But it is an indication that if the expected cut in nylon prices is forthcoming next year, the rayon producers may be unable to meet it.

At present rayon is priced at 49¢ for 1100 denier and 55¢ for 1650 and 2200 denier. Nylon yarn is 92¢ for both 840 and 1680 denier yarns, equivalent to the rayon tire yarns. Since 1.6 pounds of rayon yarn are used to every pound of nylon, the equivalent rayon costs about 78.4¢ and 88¢. The gap has become quite narrow.

The advance followed three cuts in rayon tire cord prices within the last year, coming two months after the third cut. That cut of 2½¢ a pound was the only one initiated by the rayon manufacturers and was immediately matched by the nylon makers. Two previous cuts had been made to match reductions by nylon cord makers.

American Enka in announcing the price rise noted that net sales for the nine months ending September of this year totaled $66,220,000, against $76,655,000 for the same period in 1959. More significantly, earnings had dropped to $483,000 for the period, compared with $5,287,000 for last year's first nine months.

For the 12 weeks ending September 11, American Enka showed a loss of $200,000, compared with a net profit of $1,802,000 for the 12 weeks ending September 13, 1959.

Philip B. Stull, president of American Enka Corp., attributed the declines to "a further reduction in August in the price of Tyrex tire yarn," as well as to lower shipments of all types of yarn and fiber.

Industrial Rayon Corp. showed a drop in sales of 36% for the third quarter, compared with sales of the third quarter of last year, $11,127,017, against $17,406,775, and a drop of 46% from sales of the first nine months of last year.

For the third quarter of 1960 the company showed a net loss of $997,245, contrasted with a profit of $365,816 for the third quarter of last year. For the first nine months of the year the net loss was $2,403,672, compared with a profit of $921,674 in the first nine months of 1959.

Nylon tire yarn is now reported to be used in about 52% of passenger replacement tires and 54% of heavy-service replacement tires, such as truck tires, plus about 32% of the original-equipment heavy service field. Only about 2% of original-equipment passenger tires use nylon cord.

Total packaged production of high-tenacity rayon yarn in September was 20.1 million pounds, compared with 22.8 million pounds in August. Production for the first nine months of the year was 217.3 million pounds, against 253.9 million pounds for the like period last year.

Shipments fell to 18.6 million pounds from 20.6 million pounds of high-tenacity yarn in August, and 26.6 million pounds in August of last year. For the first nine months of the year deliveries of high-tenacity yarn were 211.4 million pounds, compared with 252 million pounds for the first nine months of 1959.

End-of-the-month stock of high-tenacity yarn was 21.1 million pounds, compared with 20.2 million pounds on August 31. This was the seventeenth consecutive monthly increase in high-tenacity yarn inventory. At the end of September, 1959, the high-tenacity yarn inventory was 10.5 million pounds, about half of what it is at present.

#### Rayon Prices

Tire Fabrics

| | |
|---|---|
| 1100/490/2 | $0.69 |
| 1650/908/2 | $0.58/.615 |

Tire Yarns

| | |
|---|---|
| High-Tenacity | |
| 1100/490 | .49 |
| 1100/980 | .49 |
| 1150/490, 980 | .49 |
| 1230/490 | .49 |
| 1650/980 | .55 |
| 1875/980 | .55 |
| 2200/980 | .55 |
| Super-High Tenacity | |
| 1650/720 | .55 |

#### Nylon Prices

Tire Yarns

| | |
|---|---|
| 840/140 | .92 |
| 1680/280 | .92 |

### Industrial Fabrics

The absence of a broad contract covering movement for future production and delivery months has left the industrial fabrics market in a confused condition, with considerable indecision regarding true values of the different grades.

The good buyer response that had begun to appear near the end of the August 16-September 15 period changed during the September 16-October 15 period into a demand for fill-in supplies, with widespread appearance of broken lots of first-and second-hand offerings. These supplies represented different qualities.

Limited quantities of top-quality industrial fabrics are still selling close to posted prices, but in larger quantities prices become dependent on the individual arrangement. Still, the market appears likely to acquire a firmer tone provided quantity orders begin to come in later in the year.

#### Industrial Fabrics

Drills*

| | |
|---|---|
| 59-inch, 1.85, 68x40 . . *yd.* | $0.37/ 0.38 |
| 2.25, 68x40 | .32/ .33 |

Broken Twills*

| | |
|---|---|
| 54-inch, 1.14, 72x52 . . *yd.* | .575/.58 |
| 58-inch, 1.06, 72x52 | .61 /.625 |

Osnaburgs*

| | |
|---|---|
| 59-inch, 2.35, 32x26 | .27/.28 |
| 61-inch, 2.20, 38x28 | .29/.30 |
| 62-inch, 2.23, 32x26 | .29/.30 |

Ducks

Numbered Duck†

List less 45%

Enameling Ducks*

| | S.F. | D.F. |
|---|---|---|
| 38-inch, 2.00 yd. | .235 | .295 |
| 51.5-inch, 1.35 yd. | .4738 | .4885 |
| 57-inch, 1.22 yd. | .4838 | .50 |
| 72-inch, 1.05 yd. | .6575 | .6765 |

Hose and Belting Ducks*

| | |
|---|---|
| Basis . . . *lb.* | .67 |

Chafer Fabrics

| | |
|---|---|
| 14.40-oz/sq.yd. P.L. . . . *lb.* | .74 |
| 11.65-oz./sq.yd. S.Y. | .65 |
| 10.80-oz./sq.yd. S.Y. | .68 |
| 8.9-oz./sq.yd. S.Y. | .70 |

Sheeting*

| | |
|---|---|
| 52-inch, 3.85, 48x48 . . *yd.* | .235/.24 |
| 57-inch, 3.47, 48x48 | .245/.25 |
| 60-inch, 2.10, 64x64 | .38 |
| 2.40, 56x56 | .335/.34 |

Sateens*

| | |
|---|---|
| 53-inch, 1.12, 96x60 . . . *yd.* | .6275 |
| 1.32, 96x64 | .56 |
| 58-inch, 1.02, 96x60 | .68 |
| 1.21, 96x64 | .61 |

*Net 10 days.
†2% 10 days.

### Latex

The drum latex market remained rather slow during the September 16-October 15 period. Although the volume of inquiries was up, the actual volume of business is small. There was some interest in shipments during the first half of next year, but again for rather limited quantities.

Some business has been reported in the bulk latex market, but details were kept secret. Production in Malaya in August amounted to 9,558 tons, compared with 10,259 tons in July. Stocks were 7,681 tons, against 7,225 on July 31.

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantities, f.o.b. tank-car, were down to 39.28¢ per pound solids, compared

## market reviews

with 41.52¢ the month before. Synthetic latices prices remained unchanged: 26 to 40.24¢ for SBR; 37 to 57¢ for CR; and 45 to 60¢ for NBR.

(All figures in long tons, dry weight)

| Type of Latex | Production | Imports | Consumption | Month-End Stocks |
|---|---|---|---|---|
| Natural | | | | |
| July | 0 | 3,483 | 2,912 | 14,785 |
| Aug. | 0 | * | 3,897 | 13,690 |
| SBR | | | | |
| July | 6,481 | —— | 5,433 | 9,364 |
| Aug. | 8,096 | —— | 7,877 | 8,641 |
| Neoprene | | | | |
| July | 953 | 0 | 729 | 1,564 |
| Aug. | 978 | 0 | 1,057 | 1,333 |
| Nitrile | | | | |
| July | 983 | 0 | 780 | 2,064 |
| Aug. | 1,291 | 0 | 1,078 | 1,967 |

*Not available yet for period covered.

## Synthetic Rubber

Shell Chemical Co.'s *cis*-polyisoprene facilities at Torrance, Calif., the first in this country for commercial production of the so-called "synthetic natural" rubber in commercial quantities, was expanded to full production October 14. The plant has a capacity of 40 million pounds of polyisoprene a year.

Quoted prices were 32¢ a pound f.o.b. Torrance, 33.1¢ carload delivered, and 33.7¢ less than carload.

By the end of 1962, U. S. plants are expected to have a capacity of more than 200,000 long tons of stereospecific rubbers. Here is the partial schedule:

Firestone Tire & Rubber Co., Orange, Tex., *cis*-polybutadiene, 30,000 long tons a year, early 1961; Phillips Chemical Co., Borger, Tex., polybutadiene, 25,000 tons, January; Goodyear Tire & Rubber Co., Nederland, Tex., polyisoprene and polybutadiene, 40,000 tons, mid-1961; American Rubber & Chemical Co., Louisville, Ky., polyisoprene and polybutadiene, 30,000 tons, late 1961; Shell Chemical, Wood River, Ill., polyisoprene, 40,000 tons; Goodrich-Gulf, Orange, Tex., polyisoprene and polybutadiene, 25,000 tons, 1962; United States Rubber Co., Baton Rouge, La., ethylene-propylene and *trans*-polybutadiene, pilot plant, no date.

Consumption of new rubber in the United States in September was 124,688 long tons, compared to the August consumption of 125,836 long tons, according to the monthly report of The Rubber Manufacturers Association, Inc.

Synthetic rubber consumption in September was 87,853 long tons contrasted with 88,578 long tons in August. The ratio of synthetic rubber consumption to total new consumption continued to climb to 70.46% from the 70.39% in August.

Consumption (in long tons) by type in September was: SBR, 72,718, against 73,761 in August; CR, 7,445, against 7,200; IIR, 4,850, against 4,880; and NBR, 2,840, against 2,737.

Synthetic rubber exports for September amounted to 26,300 long tons, contrasted with 30,267 in August. Total stocks in September dropped slightly to 242,114 long tons from the 242,740 long tons in August.

Black masterbatch production in September was 7,855 long tons, against 4,584 long tons in August; oil black masterbatch, 15,018 long tons, against 18,846; and oil masterbatch, 33,076 long tons, against 39,420 long tons in August.

## Scrap Rubber

Although increase in reclaim business was expected to signal a rise in the scrap rubber market, the market remained quiet through the September 16-October 15 period. Reclaimers were not pressing for supplies and generally were content to work off their own inventories of scrap.

Prices of tires were steady, but prices of mixed auto tubes were off a quarter of a cent, and prices of butyl tubes off half to three-quarters of a cent.

| | Eastern Points | Akron, O. |
|---|---|---|
| | Per Net Ton | |
| Mixed auto tires | $7.00/$12.00 | $11.00 |
| S.A.G. truck tires | nom. | nom. |
| Peeling, No. 1 | nom. | 33.00 |
| 2 | nom. | nom. |
| 3 | nom. | nom. |
| | (¢ per Lb.) | |
| Auto tubes, mixed | 4.75 | 4.75 |
| Black | 5.75 | 5.50 |
| Red | nom. | nom. |
| Butyl | 6.75 | 6.50 |

## Reclaimed Rubber

The eagerly awaited pickup in reclaimed rubber business, which simply did not show up in September, finally made its appearance in the first two weeks of October.

An eastern reclaiming company reported that sales were about 15% behind what they were last year at this time, but added that the opening order position for October was the strongest in several months. This may very well mean a strong last quarter, the report said.

An eastern reclaimer reported that sales for the first two weeks of October were 10% higher than for the last two weeks of September. For the 30-day period of September 16-October 15 shipments were 30% higher than for the August 16-September 15 period, the reclaimer added.

On the other hand, a Midwest reclaimer reported only a slight increase in orders as October began and said the firm was hopeful that business will begin to improve. September had been slow, the reporter noted.

The slow September business had ap-

We are suppliers of resins used in various types of adhesives and will gladly refer you to some very fine people who supply adhesives made with our resins.

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We don't know—but we'd like to help you find out.

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parently been due to the reluctance of the auto industry to commit itself too soon because of the current business doldrums.

Observers predicted, however, that the successful sales of third-line tires, which use a comparatively high proportion of reclaim, insure future good business for the reclaimers.

According to The Rubber Manufacturers Association, Inc., monthly report, reclaimed rubber consumption for September increased slightly to 22,060 long tons, compared with 21,452 long tons for August. Production dropped slightly to 22,220 long tons in September, against 23,540 long tons in August. Exports for September hit 1,150 long tons, up from 951 long tons in August. Imports in August amounted to 25 long tons; the September figure is not yet available.

RECLAIMED RUBBER PRICES

| | |
|---|---|
| Whole tire, first line | $0.115 |
| Third line | .1075 |
| Inner tube, black | .17 |
| Red | .22 |
| Butyl | .17 |
| Light carcass | .22 |
| Mechanical, light-colored, medium gravity | .185 |
| Black, medium gravity | .10 |

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims, in each general group separately featuring characteristic properties of quality, workability, and specific gravity, at special prices.

## News Briefs

(*Continued from page 117*)

**ROGERS CORP., Rogers, Conn., has developed a line of molded products made of Viton molding compounds** reinforced with asbestos, glass, or ceramic fibers. The line is intended primarily for gasketing and sealing applications involving immersion in organic chemicals and hydraulic fluids at high temperatures.

**SIMON ADHESIVES PRODUCTS CORP., Long Island City, N. Y., has installed a new coating machine** with coating thickness control to one ten-thousandth of an inch, low and high viscosity compound application, and hydraulic and electric tension control throughout.

**GENERAL FOAM CORP. has finished a major addition to its Hazleton, Pa., plant** to provide the company's first basic manufacturing facilities for urethane foam. Its production capacity is sufficient to accommodate a 350% increase in sales, the company said. The start of manufacturing marks a change in company operations from a distributor and fabricator to a producer of foam products from constituent chemicals to finished forms.

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# Synthetic Rubbers and Latices*

### Monomers

| | | | |
|---|---|---|---|
| 11-80, 100, 200, 112-3 Triols | lb. | $0.225 | |
| 11-300 | lb. | .265 | |
| -400 | lb. | .325 | |
| Acrylonitrile | lb. | .27 | |
| Butadiene | lb. | .15 | |
| Dow Styrene | lb. | .12 | |
| H99, X99 | lb. | .205 | |
| RG | lb. | .17 | |
| Vinyltoluene | lb. | .17 | |
| Hylene M | lb. | 1.25 | / $2.55 |
| M-50 | lb. | .86 | / 2.36 |
| T | lb. | .85 | / 2.41 |
| TM | lb. | .70 | / 2.26 |
| -65 | lb. | .75 | / 2.31 |
| Isobutylene | gal. | .38 | |
| Isoprene | lb. | .25 | |
| Mondur-C | lb. | 1.05 | |
| Multron R-2 | lb. | .54 | |
| P200 | lb. | .23 | |
| Rohm & Haas ethyl acrylate | lb. | .34 | / .36 |
| Glacial methacrylic acid | lb. | .40 | / .425 |
| Methyl acrylate | lb. | .37 | / .39 |
| Methylacrylate | lb. | .29 | / .31 |

### Shortstops

| | | | |
|---|---|---|---|
| 4P Mercaptan | lb. | .27 | / .31 |
| DDM | lb. | .94 | / .975 |
| Mercaptan 174 | lb. | .38 | / .50 |
| Sharstop 204 | lb. | .38 | / .42 |
| 268 | lb. | .52 | / .53 |
| Tecquinol | lb. | .825 | / .845 |
| Thiostop K | lb. | .50 | / .53 |
| N | lb. | .38 | / .47 |
| Vulnapol KM | lb. | .52 | / .56 |
| NM | lb. | .38 | / .42 |
| Wingstop B | lb. | .38 | |

### Acrylic Types

| | | | |
|---|---|---|---|
| Acrylon BA-15 | lb. | | 1.25[a] |
| EA-5 | lb. | | 1.00[a] |
| Hycar 4021 | lb. | 1.34[c] | / 1.35[c] |

#### Latices

| | | | |
|---|---|---|---|
| Hycar 2600X30, 2600X39, 2601 | lb. | .50 | / .56 |

### Butadiene Types (BR†)

| | | | |
|---|---|---|---|
| Cis-1 | lb. | .35[b] | / .50[b] |

#### Cold BR Latex

| | | | |
|---|---|---|---|
| Pliolite Latex 2104 | | | .325 |

### Fluorocarbon Types

| | | | |
|---|---|---|---|
| Fluorel KF-2141 | lb. | 10.00 | / 10.25 |
| Kel-F Elastomer | lb. | 15.00 | / 16.00 |
| 5500, 820 (Latex) | lb. | 15.00 | / 17.15 |
| Viton A, AHV | lb. | 10.00 | / 10.25 |
| B | lb. | 13.00 | |

### Isobutylene Types (IIR)

| | | |
|---|---|---|
| Enjay Butyl 035, 065, 150, 215, 217, 218, 325 | | .23[a] |
| 165, 268, 365 | | .24[a] |
| Hycar 2202 | .65[c] | / .75[c] |
| Polysar Butyl 100, 200, 300, 400 | | .245[c] |
| 101 | | .2775[a] |
| 301 | | .255[c] |
| Vistanex LM | | .45[a] |
| MM | | .35[a] |

### Neoprene Types (CR)

| | | |
|---|---|---|
| Neoprene Type AC, AD, CG | .55[a] | / .575[a] |
| FB | .65[a] | / .675[a] |
| GN, GN-A, WB, WX | .41[a] | / .435[a] |
| GRT, S | .42[a] | / .445[a] |
| KNR | .75[a] | / .775[a] |
| W, WHV | .39[a] | / .415[a] |
| WD | .45 | / .475 |
| W-M1 | .40[a] | / .415[a] |
| WRT | .45[a] | / .475[a] |

#### Latices

| | | |
|---|---|---|
| Neoprene Latex 571, 842-A | .37[a] | / .47[a] |
| 572 | .39[a] | / .49[a] |
| 60, 601-A | .40[a] | / .50[a] |
| 635 | .41[a] | / .51[a] |
| 400, 650 | .42[a] | / .52[a] |
| 735, 736 | .38[a] | / .48[a] |
| 750 | .39[a] | / .49[a] |
| 950 | .47[a] | / .57[a] |

### Nitrile Types (NBR)

| | |
|---|---|
| Butaprene NF | .49[b] |
| NH | .65[b] |
| NL | .50[b] |
| NXM | .58[b] |
| Chemigum, N1NS | .64[b] |
| N3NS, N5 | .58[b] |
| N6, N-6B, N7, N8 | .50[b] |
| N600 | .50[b] |

| | | |
|---|---|---|
| Hycar 1001, 1041 | $0.58[c] | / $0.59[a] |
| 1002, 1042, 1043, 1052, 1053, 1312 | .50[c] | / .51[c] |
| 1014 | .60[c] | / .61[c] |
| 1072 | .64[c] | / .65[c] |
| 1411 | .62[c] | / .63[c] |
| 1432, 1441 | .59[c] | / .60[c] |
| Paracril, AJ | .485[c] | / .495[c] |
| B, BJ, BJLT, BLT | .50[c] | / .51[c] |
| C CLT | .58[c] | / .59[c] |
| CV | .63[c] | / .64[c] |
| D | .65[c] | / .66[c] |
| OZO | .46[c] | / .47[c] |
| 18-80 | .60[c] | / .61[c] |
| Polysar Krynac 800, 802, 803 | | .50[c] |
| 801 | | .58[c] |

#### Latices

| | | |
|---|---|---|
| Butaprene N-300 | | .46[b] |
| N-400, N-401 | | .54[b] |
| Chemigum 200 | | .49[b] |
| 235 CHS, 236 | | .54[b] |
| 245 B, 245 CHS, 246, 247, 248 | | .46[b] |
| Hycar 1512, 1552, 1562, 1577 | .45[c] | / .52[c] |
| 1551, 1561, 1571 | .53[c] | / .60[c] |
| 1852 | .46[c] | / .52[c] |
| Nitrex 2612 | .45[a] | / .52[a] |
| 2616 | .53[a] | / .60[a] |
| 2619 | .52[a] | / .59[a] |
| 2620, 2625 | .45[a] | / .52[a] |
| Tylac 640 | .45[c] | / .52[c] |
| 740 | .49[c] | / .56[c] |
| 840 | .53[c] | / .60[c] |
| 1640 | .54[c] | / .61[c] |

### Polyethylene Type

| | | |
|---|---|---|
| Hypalon 20 | lb. | .47[a] |
| 30 | lb. | .60[a] |
| 40 | lb. | .50[a] |

### Polysulfide Type

| | | |
|---|---|---|
| Thiokol LP-2, -3, -31, -32, -33 | | .96[a] |
| -8 | | 1.35[a] |
| -205 | | 4.00[a] |
| Type-A | | .50[a] |
| FA | | .69[a] |
| ST | | 1.25[a] |

#### Latices

| | | |
|---|---|---|
| Thiokol Latex (dry wt.) Type MX | | .80[a] |
| WD-2 | | 1.25[a] |
| -6 | .80[a] | / 1.25[a] |

### Silicone Types

| | | |
|---|---|---|
| GE (compounded) | 2.29[c] | / 4.90[c] |
| Silicone gum | 3.85[c] | / 4.55[c] |
| Silastic (compounded) | 2.95[b] | / 3.50[b] |
| (Partly compounded) | 3.15[b] | / 3.60[b] |
| (Uncompounded) | 4.05[b] | / 4.35[b] |
| LS-53 | 12.00 | / 16.30 |
| Union Carbide (compounds) | 2.35[b] | / 3.20[b] |
| (Gums) | 3.85[b] | / 4.25[b] |

### Styrene Types (SBR)‡

#### Hot SBR

| | | |
|---|---|---|
| Ameripol 1000, 1001, 1006, 1007 | .241[c] | / .247[c] |
| 1002 | .2435[c] | / .2495[c] |
| 1006 Crumb | .2475[c] | / .2535[c] |
| 1009 | .2475[c] | / .2535[c] |
| Crumb | .259[c] | / .265[c] |
| 1011 | .2475[c] | / .2535[c] |
| 1012 | .2425[c] | / .2485[c] |
| Crumb | .249[c] | / .255[c] |
| 1013 | .241[c] | / .247[c] |
| Crumb | .2615[c] | / .2675[c] |
| ASRC 1004, 1006 | .241[c] | / .2475[c] |
| 1009 | .2475[c] | / .2535[c] |
| 1018 | .27[c] | / .276[c] |
| 1019 | .265[c] | / .271[c] |
| Copo 1006 | .241[c] | / .247[c] |
| FR-S 1000, 1001, 1004, 1006 | .241[c] | / .247[c] |
| 1007 | .241[c] | / .247[c] |
| 1009 | .2475[c] | / .2535[c] |
| 1010 | .26[c] | / .266[c] |
| 1012 | .2425[c] | / .2485[c] |
| 1013 | .241[c] | / .247[c] |
| Crumb | .2615[c] | / .2675[c] |
| 1014 | .281[c] | / .287[c] |
| 141 | .28[c] | / .286[c] |
| 181 | .241[c] | / .247[c] |
| Naugapol 1016, 1019 | .265[b] | / .27[b] |
| 1018 | .27[b] | / .275[b] |
| 1021 | .30[b] | / .305[b] |
| 1022 | .295[b] | / .30[b] |
| 1023 | .315[b] | / .32[b] |
| 6003 | .27[b] | / .275[b] |
| Philprene 1000, 1001, 1006, 6701 | .241[b] | / .247[b] |
| 1009 | .2475[b] | / .2535[b] |
| 1018 | .27[b] | / .276[b] |
| 1019 | .265[b] | / .271[b] |
| Plioflex 1006 | .241[c] | / .247[c] |
| Polysar S-630 | .241[c] | / .247[c] |
| S-X-371 | .255[c] | / .261[c] |
| S-1000, -1006, -1013 | | .23[a] |
| -1002, -1011 | | .2325[a] |
| -1009 | | .24[a] |
| Synpol 1000, 1001, 1006, 1007, 1013, 1061 | .241[b] | / .247[b] |
| 1002 | .2435[b] | / .2495[b] |
| 1009 | .2475[b] | / .2535 |
| Synpol 1012 | $0.2425[b] | / $0.2485[b] |
| 8000 | .241[b] | / .247[b] |
| X-274 | .255[c] | / .261[c] |

#### Hot SBR Black Masterbatch

| | |
|---|---|
| Philprene 1100 | .194 |
| 1104 | .190[b] |
| S-1100 | .185[a] |

#### Hot SBR Latices

| | | |
|---|---|---|
| Copo 2000 | | .2775[a] |
| FR-S 2000, 2001 | .2725[c] | / .3425[c] |
| 2002 | .35[c] | / .36[c] |
| 2003, 2004 | .305[c] | / .36[c] |
| 2006 | .29[c] | / .382[c] |
| Naugatex 2000, 2001 | .2775[a] | / .3575[a] |
| 2002 | .30[a] | / .37[a] |
| 2006 | .29[a] | / .42[a] |
| Pliolite Latex 2000, 2001 | | .2825 |
| 2076 | | .295[c] |
| Polysar Latex II | | .29[c] |
| IV | | .2775 |
| S-2000, 2006 | | .26[a] |

#### Cold SBR

| | | |
|---|---|---|
| Ameripol 1500, 1501, 1502, 4600, 4601 | .241[c] | / .247[c] |
| ASRC 1500, 1502 | .241[c] | / .247[c] |
| 1503 | .2625[c] | / .2685[c] |
| 3105, 3106 | .241[c] | / .247[c] |
| 3110 | .26[c] | / .266[c] |
| C-102 | | .23[a] |
| Copo 1500, 1502, 1507 | .241[c] | / .247[c] |
| 1505-NS | .261[c] | / .267[c] |
| FR-S 1500, 1502, 146, 179 | .241[c] | / .247[c] |
| 127 | .26[c] | / .266[c] |
| Gentro 1500 | | .241 |
| Naugapol 1503 | .2625[b] | / .2675[b] |
| 1504 | .33[b] | / .335[b] |
| 6100 | .31[b] | / .315[b] |
| Philprene 1500, 1502 | .241[b] | / .247[b] |
| 1503 | .2625[b] | / .2685[b] |
| 6630 | .251[b] | / .257[b] |
| 6631 | .241[b] | / .247[b] |
| Plioflex 1500C, 1502, 1507, 1510 | .241[c] | / .247[c] |
| Polysar Kryflex 200 | | .251[c] |
| 252 | | .27[c] |
| Krylene NS | | .241[a] |
| SS-250, SS-250-Flake | | .2875[c] |
| S-1500, S-1502 | | .23[a] |
| 1509 | | .23[a] |
| Synpol 1500, 1502, 1551, 8103 | .241[b] | / .247[b] |

#### Cold SBR Black Masterbatch

| | | |
|---|---|---|
| Ameripol 1605 | .19[c] | / .196[c] |
| 4651 | .177[c] | / .183[c] |
| 4659 | .182[c] | / .188[c] |
| 4660 | .187[c] | / .193[c] |
| 4664 | .1845[c] | / .1905[c] |
| 4667 | .208[c] | / .214[c] |
| B-129 | | .1960[c] |
| -134 | | .1900[c] |
| -172 | | .1825[c] |
| Baytown 1600, 1601, 1602 | | .193[b] |
| 8675, 8677 | | .182[b] |
| 8676 | | .1876[b] |
| 8678 | | .208[b] |
| 8679 | | .2022[b] |
| 8680 | | .1775[b] |
| 8681 | | .1835[b] |
| Carbomix 3750 | .182[c] | / .188[c] |
| 3752 | .1845[c] | / .1905[c] |
| 3756 | .1569[c] | / .1629[c] |
| CB-102 | | .185[a] |
| Gentro-Jet 9152 | | .208 |
| 9153 | | .182 |
| 9154 | | .1845 |
| Philprene 1601 | .193[b] | / .199[b] |
| 1603 | .196[b] | / .202[b] |
| 1605 | .19[b] | / .196[b] |
| 1606 | .182[b] | / .188[b] |
| 1608 | .1845[b] | / .1905[b] |
| 1609 | .208[b] | / .214[b] |
| 6655 | .194[b] | / .20[b] |
| S-1600, -1602 | | .1825[a] |
| -1605 | | .18[a] |
| -1606, -1607 | | .175[a] |
| -7652 | | .1875[a] |
| Synpol 8151 | .182[b] | / .188[b] |
| 8152 | .186[b] | / .192[b] |

#### Cold SBR Oil Masterbatch

| | | |
|---|---|---|
| Ameripol 1705 | .2035[c] | / .2095[c] |
| 1707, 1708 | .191[c] | / .197[c] |
| 1710, 1712 | .1885[c] | / .1945[c] |
| 4700 | .175[c] | / .181[c] |
| ASCR 1703 | .206[c] | / .212[c] |
| 1708 | .191[c] | / .197[c] |
| 1712 | .1885[c] | / .1945[c] |
| 1713 | .175[c] | / .181[c] |
| Copo 1712 | .1885[c] | / .1945[c] |
| 1713 | .175[c] | / .181[c] |
| 1714 | .1725[c] | / .1785[c] |
| 1773 | .206[c] | / .212[c] |
| 1778 | .191[c] | / .197[c] |
| FR-S 1703 | .206[c] | / .212[c] |
| 1710 | .1885[c] | / .1945[c] |
| 1712 | .1885[c] | / .1945[c] |
| 123 | .196[c] | / .202[c] |
| 154, 155 | .1885[c] | / .1945[c] |
| 173 | .206[c] | / .212[c] |
| 178 | .191[c] | / .197[c] |
| Gentro 1712 | | .1885 |
| Philprene 1703 | .206[b] | / .212[b] |
| 1708 | .191[b] | / .197[b] |
| 1712 | .1885[b] | / .1945[b] |
| 6700 | .175[b] | / .181[b] |

(Continued on page 146)

[a] Freight extra.
[b] Minimum freight allowed.
[c] Freight prepaid.
* Prices are per pound carload of tank-car dry weight unless otherwise specified.
† BR—Butadiene rubber.
‡ SBR—Styrene-butadiene rubber.

# Compounding Ingredients*

## Abrasives

| | | | |
|---|---|---|---|
| Pumicestone, powdered | lb. | $0.0363/ | $0.065 |
| Rottenstone, domestic | lb. | .03 / | .04 |
| Shelblast | ton | 80.00 / | 165.00 |
| Walnut Shell Grits | ton | 50.00 / | 160.00 |

## Accelerators

| | | | |
|---|---|---|---|
| A-1 (Thiocarbanilide) | ton | .74 / | .81 |
| A-32 | ton | .66 / | .80 |
| A-100 | lb. | .52 / | .66 |
| Accelerator B | lb. | .92 | |
| 49 | lb. | .60 / | .61 |
| 52 | lb. | 1.14 | |
| 57, 62, 67, 77 | lb. | 1.04 | |
| 66 | lb. | 4.25 | |
| 89 | lb. | 1.20 | |
| 108 | lb. | .92 | |
| 552 | lb. | 2.25 | |
| 808 | lb. | .66 / | .68 |
| 833 | lb. | 1.17 / | 1.19 |
| Altax | lb. | .54 / | .56 |
| Amax | lb. | .75 / | .77 |
| No. 1 | lb. | .71 / | .73 |
| Arazate | lb. | 2.25 | |
| Beutene | lb. | .66 / | .68 |
| Bismate | lb. | 3.00 | |
| B-J-F | lb. | .27 / | .32 |
| Butazate | lb. | 1.04 | |
| Butyl Eight | lb. | 1.10 / | 1.35 |
| Namate | lb. | .45 / | .50 |
| Zimate | lb. | 1.04 | |
| Ziram | lb. | .89 / | 1.04 |
| Captax | lb. | .44 / | .46 |
| Conac S | lb. | .76 / | .78 |
| C-P-B | lb. | 1.95 | |
| Cumate | lb. | 1.45 | |
| Cydac | lb. | .71 / | .73 |
| Cyuram DS, powder | lb. | 1.14 | |
| Pellets | lb. | 1.14 | |
| MS, powder | lb. | 1.14 | |
| Pellets | lb. | 1.14 | |
| Cyzate B, E | lb. | .87 / | .89 |
| Delac-S | lb. | .71 / | .73 |
| DIBS | lb. | .85 / | .87 |
| Dipac | lb. | .85 | |
| DOTG (diorthotolylguanidine) | | | |
| Cyanamid | lb. | .69 / | .70 |
| Du Pont | lb. | .69 / | .70 |
| DPG (diphenylguanidine) | | | |
| Cyanamid | lb. | .51 / | .52 |
| Monsanto | lb. | .51 / | .57 |
| El-Sixty | lb. | .62 / | .64 |
| Ethazate | lb. | 1.04 | |
| 50-D | lb. | .87 / | .89 |
| Ethyl Seleram | lb. | 3.00 | |
| Thiurad | lb. | 1.04 | |
| Thiuram | lb. | 1.04 | |
| Tuads | lb. | 1.04 | |
| Tuex | lb. | 1.04 | |
| Zimate | lb. | 1.04 | |
| Ziram | lb. | .89 / | 1.04 |
| Ethylac #650 | lb. | .93 / | .95 |
| Guantal | lb. | .62 / | .64 |
| Hepteen Base | lb. | 1.85 | |
| Ledate | lb. | 1.04 | |
| MBT (2-mercaptobenzothiazole) | | | |
| American Cyanamid | lb. | .44 / | .46 |
| Du Pont | lb. | .44 / | .46 |
| Naugatuck | lb. | .44 / | .49 |
| -XXX, Cyanamid | lb. | .55 / | .57 |
| MBTS (mercaptobenzothiazyl disulfide) | | | |
| Cyanamid | lb. | .54 / | .56 |
| Du Pont | lb. | .54 / | .56 |
| Naugatuck | lb. | .54 / | .56 |
| -W Cyanamid | lb. | .60 / | .62 |
| Merac #225 | lb. | .75 / | 1.05 |
| Mertax | lb. | .55 / | .57 |
| Methazate | lb. | 1.04 | |
| Methyl Thiuram | lb. | 1.14 | |
| Tuads | lb. | 1.14 | |
| Zimate | lb. | 1.04 | |
| Monex | lb. | 1.14 | |
| Mono-Thiurad | lb. | 1.14 | |
| 2-MT (2-mercaptothiazoline) | | | |
| Cyanamid | lb. | .88 / | .90 |
| Du Pont | lb. | 1.00 | |
| NA-22 | lb. | 1.05 | |
| NOBS No. 1 | lb. | .71 / | .73 |
| Special | lb. | .75 / | .77 |
| O-X-A-F | lb. | .55 / | .57 |
| Pennac SDB | lb. | .45 / | .48 |
| Pentex | lb. | 1.24 | |
| Flour | lb. | .30 | |
| Permalux | lb. | 2.25 | |
| Phenex | lb. | .52 / | .59 |
| Pip-Pip | | 2.07 | |
| Polyac Pellets | lb. | 1.85 | |
| R-2 Crystals | lb. | 4.35 | |
| Rotax | lb. | .55 / | .57 |
| RZ-50, -50B | lb. | 1.00 | |
| S.A. 52 | lb. | 1.14 | |
| 57, 62, 67, 77 | lb. | 1.04 | |
| 66 | lb. | 3.00 | |
| Santocure | lb. | .71 / | .73 |
| NS | lb. | .71 / | .73 |
| Selenacs | lb. | 3.00 | |
| SPDX-GH | lb. | .69 / | .74 |
| GL | lb. | 1.20 / | 1.34 |
| Sulfads | lb. | 1.98 | |
| Tellurac | lb. | 1.30 / | 1.55 |
| Tepidone | lb. | $0.45 | |
| Tetrone A | lb. | 1.98 | |
| Thiates | lb. | .88 / | $1.25 |
| Thiofide | lb. | .54 / | .56 |
| Thionex | lb. | 1.14 | |
| Thiotax | lb. | .44 / | .46 |
| Thiurad | lb. | 1.14 | |
| Thiuram E | lb. | 1.04 | |
| M | lb. | 1.14 | |
| Trimene | lb. | .56 / | .58 |
| Base | lb. | 1.03 / | 1.06 |
| Tuex | lb. | 1.14 | |
| Ultex | lb. | 1.00 / | 1.10 |
| Unads | lb. | 1.14 | |
| Ureka Base | lb. | .66 / | .73 |
| Vulcacure NB | lb. | .45 | |
| NS | lb. | .75 / | 1.05 |
| T.M.D. | lb. | 1.14 | |
| ZB, ZE, ZM | lb. | .85 / | .89 |
| Z-B-X | lb. | 2.45 | |
| Zenite | lb. | .54 / | .56 |
| A | lb. | .69 / | .71 |
| AM | lb. | .76 / | .78 |
| Special | lb. | .55 / | .57 |
| Zetax | lb. | .55 / | .57 |
| Zimate | lb. | 1.04 | |
| ZMBT | lb. | .55 / | .57 |

## Accelerator-Activators, Inorganic

| | | | |
|---|---|---|---|
| Lime, hydrated | ton | 21.96 | |
| Litharge, comml. | lb. | .1425/ | .1575 |
| Eagle, sublimed | lb. | .1525 | |
| National Lead, sublimed | lb. | .1585 | |
| Red lead, comml. | lb. | .185 / | .195 |
| Eagle | lb. | .1575 | |
| National Lead | lb. | .1625/ | .1645 |
| PRD-90 | lb. | .38 / | .50 |
| White lead, carbonate | lb. | .19 / | .20 |
| Eagle | lb. | .17 / | .18 |
| National Lead | lb. | .18 / | .19 |
| Silicate | lb. | .1725/ | .1825 |
| Eagle | lb. | .1485 | |
| National Lead | lb. | .165 / | .175 |
| Zinc oxide, comml.† | lb. | .145 / | .155 |

## Accelerator-Activators, Organic

| | | | |
|---|---|---|---|
| Aktone | lb. | .2125/ | .2325 |
| Barak | lb. | .65 | |
| Capital 170 | lb. | .20 / | .25 |
| 171 | lb. | .1425/ | .1925 |
| 225, 258, 710 | lb. | .14 / | .19 |
| 261 | lb. | .155 / | .18 |
| 262 | lb. | .16 / | .185 |
| 263 | lb. | .1775/ | .2025 |
| 270 | lb. | .1175/ | .1425 |
| Curade | lb. | .57 / | .59 |
| D-B-A | lb. | 1.95 | |
| Emery 600 | lb. | .1225/ | .1725 |
| G-M-F | lb. | 2.60 / | 2.65 |
| PDD-70 | lb. | 2.70 / | 3.00 |
| PGD-25 | lb. | 1.25 / | 1.50 |
| Groco 30 | lb. | .1325/ | .1825 |
| Guantal | lb. | .62 / | .64 |
| Hyfac 410 | lb. | .1425/ | .1675 |
| 430 | lb. | .18 / | .205 |
| 431 | lb. | .2025/ | .2275 |
| Hystrene S-97 | lb. | .1863/ | .2125 |
| T-45 | lb. | .1638/ | .19 |
| T-70 | lb. | .1738/ | .20 |
| Industrene B | lb. | .1263/ | .1525 |
| R | lb. | .1138/ | .14 |
| 158 | lb. | .1313/ | .1575 |
| 254 | lb. | .1413/ | .1675 |
| 262 | lb. | .1513/ | .1775 |
| Laurex | lb. | .37 / | .39 |
| MODX | lb. | .295 / | .345 |
| NA-22 | lb. | 1.05 | |
| PND-70 | lb. | 1.35 / | 1.60 |
| Oleic acid, comml. | lb. | .185 / | .225 |
| Emersol 210 Elaine | lb. | .135 / | .185 |
| Groco 2, 4, 8, 18 | lb. | .1375/ | .1875 |
| Welcoline | lb. | .21 / | .42 |
| Plastone | lb. | .27 / | .30 |
| Polyac | lb. | 1.85 | |
| Ridacto | lb. | .25 / | .26 |
| Seedine | lb. | .1485/ | .1703 |
| Stearex Beads | lb. | .1488/ | .1588 |
| Stearic acid | | | |
| Emersol 120 | lb. | .1525/ | .1775 |
| 150 | lb. | .18 / | .205 |
| Hydrofoil 51 | lb. | .09 | |
| Hydrogenated, rubber grd. | | | |
| Groco 56 | lb. | .115 / | .14 |
| Rufat 75 | lb. | .1062/ | .1325 |
| Single pressed, comml. | lb. | .1475/ | .1675 |
| Emersol 110 | lb. | .1475/ | .1725 |
| Groco 53 | lb. | .1525/ | .1775 |
| Wilmar 253 | lb. | .1525/ | .1775 |
| Double pressed, comml. | lb. | .1525/ | .1725 |
| Groco 54 | lb. | .1575/ | .1825 |
| Wilmar 254 | lb. | .1575/ | .1825 |
| Triple pressed, comml. | lb. | .175 / | .195 |
| Groco 55 | lb. | .175 / | .20 |
| Wilmar 255 | lb. | .1875/ | .2075 |
| Sterene 60-R | lb. | .09 / | .1075 |
| Tonox | lb. | .54 / | .56 |
| Vimbra | lb. | .32 / | .385 |
| Vulklor | lb. | .88 / | .98 |
| Wilmar 110 | lb. | .17 / | .22 |
| 434 | lb. | .1425/ | .1925 |
| Zinc stearate, comml. | lb. | .39 / | .44 |

## Antioxidants

| | | | |
|---|---|---|---|
| AgeRite Alba | lb. | $2.40 / | $2.50 |
| Gel | lb. | .70 / | .72 |
| H. P. | lb. | .79 / | .81 |
| Hipar | lb. | 1.05 / | 1.07 |
| Powder | lb. | .57 / | .59 |
| Resin | lb. | .88 / | .90 |
| D | lb. | .57 / | .59 |
| Spar | lb. | .57 / | .59 |
| Stalite | lb. | .57 / | .59 |
| S | lb. | .57 / | .59 |
| Superlite | lb. | .57 / | .59 |
| White | lb. | 1.50 / | 1.60 |
| Akroflex C | lb. | .85 / | .87 |
| CD | lb. | .79 / | .81 |
| Albasan | lb. | .69 / | .73 |
| Alcogard 354 Powder | lb. | 1.50 / | 1.52 |
| Allied AA 1144 | lb. | .23 / | .24 |
| AA-1177 | lb. | .155 / | .165 |
| Aminox | lb. | .57 / | .59 |
| Antioxidant 425 | lb. | 2.47 / | 2.50 |
| 2246 | lb. | 1.50 / | 1.53 |
| Antisol | lb. | .23 / | .24 |
| Antisun | lb. | .15 / | .51 |
| Antox | lb. | .59 / | .61 |
| Aranox | lb. | 3.25 | |
| Betanox Special | lb. | .94 / | .96 |
| B-L-E, -25 | lb. | .57 / | .59 |
| Burgess Antisun Wax | lb. | .185 | |
| B-X-A | lb. | .55 / | .60 |
| CAO-1 | lb. | .37 / | .86 |
| -5 | lb. | 1.49 / | 1.63 |
| Copper Inhibiter X-872-L | lb. | 2.01 | |
| D-B-P-C | lb. | .54 / | 1.00 |
| Deenax | lb. | .95 | |
| Flectol H | lb. | .57 / | .59 |
| Flexamine | lb. | .79 / | .81 |
| Heliozone | lb. | .31 / | .32 |
| Ionol | lb. | .91 / | 1.65 |
| Microflake | lb. | .20 / | .24 |
| Naugawhite | lb. | .57 / | .59 |
| NBC | lb. | 1.67 | |
| Neozone A | lb. | .64 / | .66 |
| C | lb. | .86 / | .88 |
| D, Special | lb. | .57 / | .59 |
| Nevastain A | lb. | .51 / | .61 |
| B | lb. | .51 / | .70 |
| Nonox CI | lb. | 1.50 / | 1.67 |
| WSL | lb. | 1.50 / | 1.60 |
| WSP | lb. | 1.47 / | 1.60 |
| Octamine | lb. | .57 / | .59 |
| PDA-10 | lb. | .46 / | .48 |
| Pennox A, C, D | lb. | .57 / | .59 |
| B | lb. | .67 / | .69 |
| Permalux | lb. | 2.25 | |
| Polygard | lb. | .57 / | .59 |
| Polylite | lb. | .55 / | .60 |
| Protector | lb. | .41 | |
| Rio Resin | lb. | .70 / | .72 |
| Santoflex | | | |
| 75 | lb. | 1.01 / | 1.03 |
| AW | lb. | .71 / | .73 |
| DD | lb. | .57 / | .59 |
| Santovar A | lb. | 1.55 / | 1.57 |
| Santowhite Crystals, Powd. | lb. | 1.55 / | 1.57 |
| L | lb. | .57 / | .59 |
| MK | lb. | 1.25 / | 1.27 |
| Stabilite | lb. | .55 / | .59 |
| Alba | lb. | .72 / | .79 |
| L | lb. | .60 / | .64 |
| White | lb. | .52 / | .60 |
| Powder | lb. | .41 / | .47 |
| Styphen I | lb. | .51 / | .55 |
| Sunolite #100 | lb. | .21 / | .23 |
| #127 | lb. | .17 / | .19 |
| Sunproof-713 | lb. | .26 / | .27 |
| Improved | lb. | .25 / | .26 |
| Jr. | lb. | .22 / | .23 |
| Tenamene 3 | lb. | .91 / | 1.05 |
| Thermoflex A | lb. | 1.05 / | 1.07 |
| Tonox | lb. | .54 / | .59 |
| Velvapex 51-250 | lb. | .40 | |
| V-G-B | lb. | .75 / | .80 |
| Wing-Stay S, T | lb. | .55 / | .67 |
| Zalba | lb. | 1.10 | |
| Zenite | lb. | .52 / | .54 |

## Antiozonants

| | | | |
|---|---|---|---|
| Eastozone 30, 31 | lb. | 1.05 / | 1.09 |
| 32 | lb. | 1.15 / | 1.20 |
| Flexone 3-C | lb. | 2.00 | |
| 6-H | lb. | 1.25 / | 1.27 |
| Nonox ZA | lb. | 1.99 / | 2.00 |
| Santoflex AW | lb. | .71 / | .73 |
| Tenamene 30, 31 | lb. | 1.24 / | 1.28 |
| Tysonite | lb. | .30 / | .307 |
| UOP 88, 288 | lb. | 1.05 / | 1.07 |
| Wing-Stay 100 | lb. | 1.00 / | 1.08 |

## Antiseptics

| | | | |
|---|---|---|---|
| Copper naphthenate, 6-8% | lb. | .245 | |
| Pentachlorophenol | lb. | .22 / | .30 |
| Resorcinol, technical | lb. | .775 / | .785 |
| Zinc naphthenate, 8-10% | lb. | .245 / | .30 |

## Blowing Agents

| | | | |
|---|---|---|---|
| Ammonium bicarbonate | lb. | .07 / | .09 |
| Carbonate | lb. | .16 | |

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

| | | | |
|---|---|---|---|
| Blowing Agent 8110S | lb. | $0.32 / | $0.35 |
| Celogen | lb. | 1.95 | |
| -80 | lb. | 1.60 | |
| -AZ | lb. | 1.92 | |
| Kempore R-125 | lb. | 1.92 | |
| Opex 40 | lb. | .72 | |
| PL-80 | lb. | 1.44 | |
| Sodium bicarbonate | 100 lbs. | 2.55 / | 3.85 |
| Carbonate, tech. | 100 lbs. | 1.35 / | 5.52 |
| Sponge Paste | lb. | .20 | |
| Unicel ND | lb. | .72 | |
| NDX | lb. | 1.44 | |
| S | lb. | .20 | |
| Vulcacel BN | lb. | 1.36 / | 1.51 |
| BMC | lb. | .68 / | .79 |

## Bonding Agents

| | | | |
|---|---|---|---|
| Braze | gal. | 6.00 / | 9.00 |
| Cover cement | gal. | 2.50 / | 4.00 |
| Chemlok 201, 203 | gal. | 5.00 / | 7.50 |
| 220 | gal. | 9.25 / | 12.00 |
| 401 | gal. | 11.70 / | 14.40 |
| 602 | gal. | 25.00 / | 26.00 |
| 607 | gal. | 18.00 | |
| 614 | lb. | 4.35 / | 4.75 |
| Flocking Adhesive RFA17, RFA22, RFA25 | lb. | .50 | |
| G-E Silicone Paste SS-15 | lb. | 4.52 / | 5.10 |
| SS-64 | lb. | 3.65 / | 6.75 |
| -67 Primer | lb. | 7.50 / | 12.50 |
| Gen-Tac Latex | lb. | .70 / | .805 |
| Hylene M | lb. | 1.25 / | 2.75 |
| M-50 | lb. | .86 / | 2.36 |
| Kalabond Adhesive | gal. | 6.50 / | 16.00 |
| Tie Cement | gal. | 2.00 / | 5.60 |
| Thixons | gal. | 1.48 / | 12.00 |
| Ty Ply, BN, Q, S, UP, 3640 | gal. | 6.75 / | 8.00 |
| BC | gal. | 4.50 / | 6.00 |
| RC | gal. | 3.75 / | 5.00 |

## Brake Lining Saturants

| | | | |
|---|---|---|---|
| BRT 3 | lb. | .018 / | .0265 |
| Resinex L-S | lb. | .0225/ | .03 |

## Carbon Blacks‡

### Conductive Channel—CC

| | | | |
|---|---|---|---|
| Continental R-40 | lb. | .26 / | .35 |
| Kosmos/Dixie BB | lb. | .23 / | .30 |
| Texas MC-74-BD | lb. | .26 / | .35 |
| Voltex | lb. | .18 / | .315 |

### Easy Processing Channel—EPC

| | | | |
|---|---|---|---|
| Continental AA | lb. | .08 / | .1625 |
| Kosmobile 77/Dixiedensed 77 | lb. | .074 / | .1225 |
| Micronex W-6 | lb. | .08 / | .1625 |
| Spheron #9 | lb. | .085 / | .1625 |
| Texas E | lb. | .08 / | .1625 |
| Witco #12 | lb. | .08 / | .1625 |
| Wyex EPC | lb. | .08 / | .1625 |

### Medium Processing Channel—MPC

| | | | |
|---|---|---|---|
| Arrow MPC | lb. | .08 / | .1625 |
| Continental A | lb. | .08 / | .1625 |
| Kosmobile S-66/Dixiedensed S-66 | lb. | .0775/ | .145 |
| Micronex Standard | lb. | .08 / | .1625 |
| Spheron #6 | lb. | .085 / | .1625 |
| Texas M | lb. | .08 / | .1625 |
| Witco #1 | lb. | .08 / | .1625 |

### Conductive Furnace—CF

| | | | |
|---|---|---|---|
| Aromex CF | lb. | .0875/ | .155 |
| Continex CF | lb. | .11 / | .17 |
| Vulcan C | lb. | .110 / | .185 |
| SC | lb. | .18 / | .255 |
| XC-72 | lb. | .25 / | .34 |

### Fast Extruding Furnace—FEF

| | | | |
|---|---|---|---|
| Arovel FEF | lb. | .0625/ | .135 |
| Continex FEF | lb. | .0625/ | .135 |
| Kosmos 50/Dixie 50 | lb. | .06 / | .10 |
| Philblack A | lb. | .0675/ | .135 |
| Statex M | lb. | .0625/ | .135 |
| Sterling SO | lb. | .0675/ | .135 |

### Fine Furnace—FF

| | | | |
|---|---|---|---|
| Statex B | lb. | .0675/ | .14 |
| Sterling 99 | lb. | .0725/ | .14 |

### High Abrasion Furnace—HAF

| | | | |
|---|---|---|---|
| Aromex HAF | lb. | .0725/ | .145 |
| Continex HAF | lb. | .0725/ | .145 |
| Kosmos 60/Dixie 60 | lb. | .079 / | .1175 |
| Philblack O | lb. | .0775/ | .145 |
| Statex R | lb. | .0725/ | .145 |
| Vulcan #3 | lb. | .0775/ | .145 |

### Intermediate Super Abrasion Furnace—ISAF

| | | | |
|---|---|---|---|
| Aromex ISAF | lb. | .0875/ | .16 |
| Continex ISAF | lb. | .0875/ | .16 |
| Kosmos 70/Dixie 70 | lb. | .10 / | .045 |
| Philblack I | lb. | .0925/ | .16 |
| Statex 125 | lb. | .0875/ | 16 |
| Vulcan 6 | lb. | .0925/ | .16 |

### General-Purpose Furnace—GPF

| | | | |
|---|---|---|---|
| Arogen GPF | lb. | .055 / | .1275 |
| Continex GPF | lb. | .055 / | .1275 |
| Statex G | lb. | .055 / | .1275 |
| Sterling V | lb. | .06 / | .1275 |
| Non-staining | lb. | .06 / | .1275 |

### High Modulus Furnace—HMF

| | | | |
|---|---|---|---|
| Continex HMF | lb. | $0.0575/ | $0.13 |
| Kosmos 40/Dixie 40 | lb. | .055 / | .095 |
| Modulex HMF | lb. | .0625/ | .13 |
| Statex 93 | lb. | .0575/ | .13 |
| Sterling L, LL | lb. | .0625/ | .13 |

### Semi-Reinforcing Furnace—SRF

| | | | |
|---|---|---|---|
| Continex SRF | lb. | .0525/ | .125 |
| Essex SRF | lb. | .0525/ | .125 |
| Furnex | lb. | .0525/ | .125 |
| Gastex | lb. | .0625/ | .135 |
| Kosmos 20/Dixie 20 | lb. | .0575/ | .0775 |
| Pelletex, NS | lb. | .0575/ | .125 |
| Regal | lb. | .0575/ | .125 |
| Sterling NS, S | lb. | .0575/ | .125 |
| R | lb. | .0625/ | .135 |

### Super Abrasion Furnace—SAF

| | | | |
|---|---|---|---|
| Aromex SAF | lb. | .1150/ | .1825 |
| Philblack E | lb. | .115 / | .19 |
| Statex 160 | lb. | .11 / | .19 |
| Vulcan 9 | lb. | .115 / | .19 |

### Fine Thermal—FT

| | | | |
|---|---|---|---|
| P-33 | lb. | .0575/ | .0625 |
| Sterling FT | lb. | .0625 | |

### Medium Thermal—MT

| | | | |
|---|---|---|---|
| Sterling MT | lb. | .045 | |
| Non-staining | lb. | .055 | |
| Thermax | lb. | .04 / | .045 |
| Stainless | lb. | .05 / | .055 |

### Awaiting Classification

| | | | |
|---|---|---|---|
| Neotex 100 | lb. | .0725/ | .145 |
| 130 | lb. | .0875/ | .16 |
| 150 | lb. | .11 / | .19 |
| Regal 300 | lb. | .0775/ | .145 |
| 600 | lb. | .0925/ | .16 |

## Colors

### Black

| | | | |
|---|---|---|---|
| Iron oxides, comml. | lb. | .1235/ | .135 |
| BK—Lansco | lb. | .1275/ | .13 |
| Williams | lb. | .145 | |
| Lansco synthetic | lb. | .10 | |
| Mapico pure synthetic | lb. | .1475/ | .15 |
| Lampblack, comml. | lb. | .16 / | .45 |
| Superjet | lb. | .085 / | .12 |
| Permanent Blue | lb. | .80 / | 1.05 |
| Stan-Tone | lb. | .45 / | 1.20 |
| Vansul masterbatch | lb. | .60 / | .65 |
| Paste | lb. | .14 / | .15 |

### Blue

| | | | |
|---|---|---|---|
| Alkali Blue G, R | lb. | 2.38 | |
| C. P. Iran Blues | lb. | .52 / | .54 |
| Du Pont | lb. | 2.55 / | 4.75 |
| Filo | lb. | .28 | |
| Heveatex pastes | lb. | .80 / | 1.45 |
| Lansco ultramarines | lb. | .25 / | .28 |
| Monsanto Blue 7 | lb. | 1.55 | |
| 11 | lb. | 3.45 | |
| DPB-283 | lb. | 1.93 | |
| S-11 | lb. | 2.05 | |
| Permanent Blue | lb. | .80 / | 1.05 |
| Solfast | lb. | 1.60 / | 3.25 |
| Stan-Tone Violet Blue | | | |
| D-4000 | lb. | 3.45 | |
| 4001 | lb. | 3.00 | |
| 4002 | lb. | .90 | |
| 4900 | lb. | 1.97 / | 2.15 |
| Vansul masterbatch | lb. | .90 / | 2.70 |

### Brown

| | | | |
|---|---|---|---|
| Filo | lb. | .13 | |
| Iron oxides, comml. | lb. | .1425/ | .145 |
| Lansco synthetic | lb. | .125 | |
| Mapico Brown | lb. | .1575/ | .16 |
| Sienna, burnt, comml. | lb. | .0425/ | .155 |
| Williams | lb. | .115 / | .1775 |
| Raw, comml. | lb. | .045 / | .1325 |
| Williams | lb. | .08 / | .1725 |
| Umber, burnt, comml. | lb. | .06 / | .07 |
| Williams | lb. | .0725/ | .085 |
| Raw, comml. | lb. | .0625/ | .07 |
| Williams | lb. | .07 / | .0825 |
| Williams, pure brown | lb. | .155 | |
| Vandyke | lb. | .12 | |
| Mapico Tan | lb. | .2325/ | .235 |
| Metallic brown pure synthetic | lb. | .05 / | .06 |
| Vansul masterbatch | lb. | 2.10 / | 2.20 |

### Green

| | | | |
|---|---|---|---|
| Chrome | lb. | .42 / | .45 |
| Green | lb. | .80 / | 2.40 |
| Oxide | lb. | .3925/ | 1.10 |
| Cyanamid | lb. | .42 / | .45 |
| Green G | lb. | 3.00 | |
| Lincoln Green | lb. | 5.30 / | 6.60 |
| G-4099-6099 | lb. | .4450/ | .4525 |
| GH-9869 | lb. | 1.10 / | 1.25 |
| 9976 | lb. | 1.20 / | 1.35 |
| Du Pont | lb. | 2.05 / | 2.80 |
| Filo | lb. | .40 | |
| Heveatex pastes | lb. | .95 / | 1.85 |
| Lansco Toner | lb. | 1.35 | |
| Monsanto Green 3 | lb. | 2.75 | |
| 14 | lb. | 1.45 | |
| 17 | lb. | 3.95 | |
| 71205 | lb. | 1.35 | |
| DGP | lb. | 2.03 | |
| S-17 | lb. | 2.25 | |

| | | | |
|---|---|---|---|
| Permansa | lb. | $1.45 | |
| Serene | lb. | 3.50 | |
| Solfast | lb. | 1.60 / | $3.35 |
| Stan-Tone | | | |
| D-5000 | lb. | 3.95 | |
| 5001 | lb. | .82 | |
| 5400 | lb. | 1.50 | |
| Vansul masterbatch | lb. | 2.00 / | 2.60 |

### Orange

| | | | |
|---|---|---|---|
| Benzidine 12193 | lb. | 3.30 | |
| Cyanamid Permatons | lb. | 1.56 | |
| Dianisidine 10406 | lb. | 2.85 | |
| Du Pont | lb. | 2.25 | |
| Molybdate | lb. | .49 | |
| Monsanto Orange 68187 | lb. | 2.90 | |
| Stan-Tone | | | |
| Light orange 70 PCO3 | lb. | 2.48 / | 2.76 |
| D-7003 | lb. | 3.97 / | 4.17 |
| Orange 70 PCO4 | lb. | 2.80 / | 3.08 |
| D-7004 | lb. | 4.23 / | 4.43 |
| 7104 | lb. | 1.85 / | 2.05 |
| Vansul masterbatch | lb. | 2.00 / | 2.60 |

### Red

| | | | |
|---|---|---|---|
| Antimony trisulfide | lb. | .285 / | .315 |
| R. M. P. No. 3 | lb. | .72 | |
| Sulfur Free | lb. | .78 | |
| Arcturus CP-1270 | lb. | 1.35 | |
| Brilliant Toning Red | lb. | .77 / | 1.90 |
| Cadmium red lithopones | lb. | 2.21 / | 3.77 |
| Cadmolith | lb. | 1.72 / | 2.20 |
| Cyanamid | lb. | .91 / | 2.00 |
| Naphthol Red, Scarlet | lb. | 2.95 / | 3.80 |
| Du Pont | lb. | 2.00 / | 2.05 |
| Filo | lb. | .11 | |
| Indian Red | lb. | .1275 | |
| Iron oxide, comml. | lb. | .06 / | .13 |
| Lansco synthetic | lb. | .1175 | |
| Mapico pure synthetic | lb. | .1425/ | .145 |
| Recco | lb. | .12 | |
| Williams Red | lb. | .13 / | .1525 |
| Lake Red C, CP-1104 | lb. | 1.25 | |
| Monsanto Maroon 113 | lb. | 1.50 | |
| 61148 | lb. | 1.75 | |
| Red 7 | lb. | 1.55 | |
| 41 | lb. | 4.40 | |
| 3501 | lb. | 1.15 | |
| 4004 | lb. | 1.50 | |
| 69191 | lb. | 3.38 | |
| Autumn | lb. | 1.10 | |
| PRP-285 | lb. | 1.27 | |
| S-44 | lb. | 1.28 | |
| Plasticone | lb. | 1.02 / | 4.60 |
| Rub-Er-Red | lb. | .0975 | |
| Solfast | lb. | 1.60 / | 1.80 |
| Stan-Tone | | | |
| 70 PCO5 | lb. | 3.00 / | 3.28 |
| D-2000 | lb. | 1.25 | |
| 2110, 2120, 2121 | lb. | .98 | |
| 2200 | lb. | 1.47 | |
| 2500 | lb. | 1.90 | |
| 2600 | lb. | 4.60 | |
| 2601 | lb. | 1.60 | |
| 2700 | | 1.75 | |
| 2800 | lb. | 1.90 | |
| Light Red D-7005 | lb. | 4.68 / | 4.88 |
| 7105 | lb. | 1.97 / | 2.17 |
| Red 70 PCO6 | lb. | 3.35 / | 3.63 |
| D-7006 | lb. | 4.89 / | 5.09 |
| -7106 | lb. | 2.20 / | 2.40 |
| Vansul masterbatch | lb. | .95 / | 3.30 |
| Venetian | lb. | .04 / | .0675 |

### White

| | | | |
|---|---|---|---|
| Antimony oxide | lb. | .27 / | .285 |
| Burgess Iceberg | ton | 50.00 / | 80.00 |
| Cryptone BT | lb. | .10 / | .11 |
| Permolith lithopone | lb. | .0825/ | .0912 |
| Titanium pigments | | | |
| Horse Head Anatase | lb. | .255 / | .27 |
| Rutile | lb. | .275 / | .29 |
| Rayox LW | lb. | .195 / | .205 |
| R-110 | lb. | .215 / | .225 |
| Ti-Cal | lb. | .075 / | .0825 |
| Ti-Pure | lb. | .195 / | .225 |
| Titanox A, AA, A-168 | lb. | .255 / | .265 |
| C-50 | lb. | .1438/ | .1488 |
| RA, -10, -50 | lb. | .275 / | .285 |
| RC | lb. | .0963/ | .1013 |
| -HT, -HTX | lb. | .0963/ | .0988 |
| Rutile | lb. | .205 / | .29 |
| Unitane | lb. | .255 / | .29 |
| Zopaque Anatase | lb. | .245 / | .27 |
| Zinc oxide, comml. | lb. | .145 / | .1825 |
| Azo ZZZ-11, -44, -55 | lb. | .145 / | .155 |
| 12% leaded | lb. | .125 / | .135 |
| 35% leaded | lb. | .15375/ | .16375 |
| 50% leaded | lb. | .1575/ | .1675 |
| Eagle AAA, lead free | lb. | .145 / | .155 |
| 5% leaded | lb. | .145 / | .155 |
| 35% leaded | lb. | .15375/ | .16375 |
| 50% leaded | lb. | .1575/ | .1675 |
| Florence Green Seal | lb. | .1625/ | .1725 |
| Red Seal | lb. | .1575/ | .1675 |
| White Seal | lb. | .1675/ | .1775 |
| Horsehead XX-4, -78 | lb. | .145 / | .155 |
| Kadox-15, -17, -72, -515 | lb. | .145 / | .155 |
| -25 | lb. | .15 / | .16 |
| Lehigh, 35% leaded | lb. | .15375/ | .16375 |
| 50% leaded | lb. | .1575/ | .1675 |

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

Zinc Oxide (*Cont'd*)

| | | | |
|---|---|---|---|
| Protox-166, -167 | lb. | $0.145 | $0.155 |
| St. Joe, lead free | lb. | .145 | .175 |
| Zinc sulfide, comml. | lb. | .253 | .263 |
| Cryptone ZS | lb. | .253 | .263 |

### Yellow

| | | | |
|---|---|---|---|
| Benzidine 12199 | lb. | .58 | 2.55 |
| Cadmium yellow lithopones | lb. | 1.12 | 1.15 |
| Cadmolith | lb. | 1.12 | 1.20 |
| Chrome | lb. | .135 | .145 |
| Cyanamid Hansa Yellow | lb. | 2.20 | |
| Du Pont | lb. | 2.25 | |
| Filo | lb. | .10 | |
| Iron oxide, comml. | lb. | .0525 | .1175 |
| Lansco synthetic | lb. | .1075 | |
| Mapico pure synthetic | lb. | .12 | .1275 |
| Williams | lb. | .115 | .1225 |
| Lightfast Benzidine 12220 | lb. | 3.40 | |
| Monsanto Yellow 14 | lb. | 1.91 | |
| 10010 | lb. | 1.91 | |
| BYP-282 | lb. | 1.21 | |
| GA | lb. | 2.45 | |
| S-10010 | lb. | 1.17 | |
| Stan-Tone | | | |
| D-1100 | lb. | 2.55 | |
| 1101 | lb. | .69 | |
| Lemon 70 PCO1 | lb. | 1.77 | 2.19 |
| D-7001 | lb. | 2.80 | 3.00 |
| Medium yellow 70 PCO2 | lb. | 1.79 | 2.21 |
| D-7002 | lb. | 2.98 | 3.18 |
| Vansul masterbatch | lb. | .95 | 1.95 |
| Williams Ocher | lb. | .0575 | .06 |

### Dusting Agents

| | | | |
|---|---|---|---|
| Antidust | lb. | .37 | .41 |
| Diatomaceous silica | ton | 32.00 | 48.00 |
| Extrud-o-Lube, conc. | gal. | 1.33 | 1.69 |
| Glycerized Liquid Lubricant, concentrated | gal. | 1.25 | 1.63 |
| Glyso-Lube, #3 | lb. | .14 | |
| Latex-Lube GR | lb. | .20 | |
| Pigmented | lb. | .1825 | |
| R-66 | lb. | .165 | |
| Liqui-Lube | lb. | .1625 | |
| N. T. | lb. | .1675 | |
| Liquizinc No. 305 | lb. | .30 | .35 |
| Lubrex | lb. | .25 | .30 |
| Mica 160 Biotite | lb. | .065 | .0725 |
| Mesh | lb. | .08 | .0875 |
| 325 Mesh | lb. | .0825 | .09 |
| Concord | lb. | .08 | .09 |
| Mineralite | ton | 45.00 | |
| Pigmented Separex, LG | lb. | .105 | |
| Slab-Dip, S-20 | lb. | .11 | .15 |
| Pyrax A | ton | 14.50 | 15.00 |
| W. A. | ton | 17.00 | 17.50 |
| Rexanol | lb. | .13 | |
| Talc, comml. | ton | 18.40 | 38.50 |
| EM | ton | 11.00 | 63.00 |
| LS Silver | ton | 29.25 | |
| Nytals | ton | 28.00 | 38.00 |
| Sierra Sagger 7 | ton | 34.00 | |
| White IR | ton | 19.75 | |
| III | ton | 20.75 | |
| Vanfre | gal. | 1.95 | 3.00 |
| Wet-Zinc, CW, P | lb. | .20 | .2225 |

### Extenders

| | | | |
|---|---|---|---|
| BRS 700 | lb. | .02 | .036 |
| BRT 7 | lb. | .035 | .036 |
| Cumar Resins | lb. | .095 | .19 |
| Dielex B | lb. | .06 | |
| Factice, Amberex | lb. | .29 | .36 |
| Brown | lb. | .1425 | .263 |
| Neophax | lb. | .157 | .268 |
| White | lb. | .144 | .285 |
| G. B. Asphaltenes | lb. | .097 | .177 |
| Millex, W | lb. | .07 | |
| Mineral Rubbers | | | |
| Black Diamond | ton | 38.00 | 40.00 |
| Hard Hydrocarbon | ton | 53.00 | 60.00 |
| Hydrocarbon MR | ton | 45.00 | 55.00 |
| Parmr | ton | 21.00 | 29.00 |
| T-MR Granulated | ton | 47.50 | 50.00 |
| Nuba No. 1, 2 | lb. | .0575 | .0625 |
| 3X | lb. | .0775 | .0825 |
| OPD-101 | lb. | .26 | |
| Rubber substitute, brown | lb. | .16 | .2572 |
| Car-Bel-Ex A | lb. | .14 | |
| Car-Bel-Lite | lb. | .35 | |
| Extender 600 | lb. | .1765 | |
| White | lb. | .192 | .2103 |
| Stan-Shells | ton | 35.00 | 73.00 |
| Sublac Resin PX-5 | lb. | .215 | .235 |
| Sundex 53 | gal. | .12 | |
| 85 | gal. | .1725 | |
| Synthetic 100 | lb. | .41 | |
| Vistanex L grades | lb. | .35 | |

### Fillers, Inert

| | | | |
|---|---|---|---|
| Agrashell flour | ton | 50.00 | 74.00 |
| Albacar | ton | 55.00 | 75.00 |
| Barytes, floated, white | ton | 49.00 | 70.85 |
| No. 1 | ton | 55.00 | 77.50 |
| 2 | ton | 50.00 | 72.50 |
| Off-color, domestic | ton | 25.00 | |
| Sparmite | ton | 95.00 | 117.00 |
| Blanc fixe | ton | 100.00 | 165.00 |
| Burgess HC-75 | ton | 12.00 | 30.00 |
| 80 | ton | 14.00 | 32.00 |
| Iceberg | ton | 50.00 | 80.00 |
| Pigment #20 | ton | 35.00 | 60.00 |
| #30 | ton | 37.00 | 60.00 |
| WP #1 | ton | 11.00 | 16.00 |
| Camel-Carb | ton | $14.00 | |
| -Tex | ton | 22.00 | |
| -Wite | ton | 35.00 | |
| Cary #200 | ton | 30.00 | $55.00 |
| CCC #1 | ton | 15.00 | 17.00 |
| "G" | ton | 10.50 | 12.50 |
| Citrus seed meal | lb. | .04 | |
| Oil | lb. | .15 | |
| Diatomaceous silica | ton | 32.00 | 48.00 |
| Flocks | | | |
| Cotton, dark | lb. | .095 | .135 |
| Dyed | lb. | .55 | .60 |
| White | lb. | .13 | .33 |
| Fabrifil X-24-G | lb. | .135 | |
| X-24-W | lb. | .235 | |
| Filfloc 6000 | lb. | .33 | |
| F-40-900 | lb. | .135 | |
| HSC #35 Silicone Emulsion | lb. | 1.22 | 2.46 |
| Hydrite | ton | 25.00 | 50.00 |
| Kalite | ton | 52.50 | 67.50 |
| Lithopone, comml. | lb. | .075 | .085 |
| Eagle | lb. | .0725 | .075 |
| Permolith | lb. | .08 | .0875 |
| Sunolith | lb. | .075 | .0825 |
| Mica, 160 Biotite | lb. | .065 | .0725 |
| Mesh | lb. | .08 | .0875 |
| 160 Mesh, 325 Mesh | lb. | .075 | .09 |
| Concord | lb. | .08 | .09 |
| Millical | ton | 38.00 | 53.00 |
| Mineralite | ton | 40.00 | 60.00 |
| Non-Fer-Al | ton | 35.00 | 50.00 |
| Ohio Superspray lime | ton | 16.50 | |
| Pulverized limestone, Stonelite | ton | 8.25 | 11.00 |
| Purecal | ton | 56.75 | 71.75 |
| Pyrax A | ton | 14.50 | 15.00 |
| W. A. | ton | 17.00 | 17.50 |
| Sawdust | ton | 14.00 | 35.00 |
| Silversheen Mica | lb. | .08 | .09 |
| Stan White | ton | 10.50 | 13.10 |
| Super-White Silica | ton | 25.00 | 46.50 |
| Surfex | ton | 37.50 | 52.50 |
| MM | ton | 42.00 | 57.00 |
| Suspenso | ton | 38.00 | 53.00 |
| Ti-Cal | lb. | .0675 | |
| Valron Estersil | lb. | 2.00 | 2.25 |
| Walnut shell flours | ton | 50.00 | 84.00 |
| Whiting, limestone | | | |
| Atomite | ton | 32.50 | 35.00 |
| Calcite | ton | 23.00 | |
| Calwhite | ton | 20.00 | 27.00 |
| -T | ton | 23.00 | |
| Duramite | ton | 20.00 | |
| Gamaco | ton | 32.50 | 40.00 |
| Keystone | ton | 20.00 | 22.00 |
| Laminar | ton | 30.00 | |
| No. 10 White | ton | 11.00 | 16.50 |
| Omya | ton | 30.00 | |
| BSH | ton | 45.00 | |
| Paxinosa | ton | 14.50 | 22.50 |
| Snowflake | ton | 17.00 | 18.00 |
| Witco | ton | 13.00 | |
| York | ton | 9.50 | |

## Note

Suppliers are requested to submit product additions or deletions and price changes promptly as they occur in order that we may make the listing of maximum service to our readers. Comments on the present listing and classifications are invited with a view toward facilitating location of specific items.

Correspondence should be directed to Market Editor, RUBBER WORLD, 630 Third Avenue, New York 17, New York.

### Finishes

| | | | |
|---|---|---|---|
| Apex Bright Finish #5200-E | lb. | .25 | |
| Rubber Finish | gal. | 2.50 | |
| Black-out | gal. | 4.50 | 8.00 |
| Flocks, Rayon, colored | lb. | .90 | 1.50 |
| White | lb. | .75 | 1.25 |
| *Also see Flocks, under Fillers, Inert* | | | |
| Paraflint RG and RGU Synthetic Wax | lb. | .15 | .22 |
| Rubber lacquer, clear | gal. | 1.00 | 2.00 |
| Shellacs, Angelo | lb. | .485 | .7325 |
| Vac Dry | lb. | .485 | .57 |
| Talc (*See Talc, under Dusting Agents*) | | | |
| Unidip | lb. | .15 | .20 |
| Wax, Bees | lb. | .67 | .83 |
| Carnauba | lb. | .57 | 1.13 |
| Monten | lb. | .27 | |
| Neutral | gal. | .76 | 1.31 |
| No. 118, colors | gal. | .86 | 1.41 |
| Van Wax | gal. | 2.00 | 2.05 |

### Latex Compounding Ingredients

| | | | |
|---|---|---|---|
| Acintol D, DLR | lb. | .0625 | .085 |
| FA #1 | lb. | .0675 | .09 |
| #2 | lb. | .0825 | .105 |
| Accelerator 552 | lb. | $2.25 | |
| Accelerator J-117, -302 | lb. | 1.00 | $1.15 |
| -144 | lb. | .15 | .30 |
| -307 | lb. | 1.10 | 1.25 |
| -311 | lb. | .60 | .75 |
| Aerosol, dry types | lb. | .65 | .80 |
| Liquid types | lb. | .40 | .75 |
| Alcogard 354 | lb. | 1.40 | 1.42 |
| Alcogum AK-12 | lb. | .12 | .14 |
| AN-6 | lb. | .055 | .06 |
| -10 | lb. | .09 | .10 |
| -25 | lb. | .31 | |
| PA-15 | lb. | .16 | |
| Alrosol | lb. | .41 | |
| Amberex solutions | lb. | .1675 | .18 |
| Antifoam J-114 | lb. | 3.25 | 3.45 |
| P-242 | lb. | .24 | .35 |
| Antioxidant J-137, -140 | lb. | .55 | .70 |
| -139, -293 | lb. | 1.45 | 1.60 |
| -182 | lb. | 2.00 | 2.15 |
| -186 | lb. | 1.40 | 1.55 |
| 2246 | lb. | 1.50 | 1.53 |
| Anti Webbing Agent J-183 | lb. | .75 | .90 |
| -297 | lb. | .27 | .40 |
| Aquablak B | lb. | .1075 | .1175 |
| G | lb. | .13 | .14 |
| K | lb. | .13 | .14 |
| M | lb. | .12 | .13 |
| Aquarex D | lb. | .81 | |
| G | lb. | .21 | |
| L | lb. | .94 | |
| MDL | lb. | .33 | |
| ME | lb. | .82 | |
| Aquarex NS | lb. | .60 | |
| SMO | lb. | .50 | |
| WAQ | lb. | .22 | |
| Ben-A-Gels | lb. | .98 | 1.40 |
| Bentone 18, 18C | lb. | .45 | |
| 34 | lb. | .60 | |
| Casein | lb. | .22 | |
| Cellosize WP-09, -3, -40, -300 | lb. | 1.00 | 1.17 |
| CW-12 | lb. | .85 | |
| -37 | lb. | .70 | |
| DC Antifoam A Compound | lb. | 5.45 | 6.65 |
| B | lb. | .63 | 1.10 |
| Emulsion | lb. | 2.05 | 4.00 |
| AF Emulsion | lb. | 2.05 | 2.85 |
| Compound 7 | lb. | 5.13 | 6.50 |
| Defoama W-1701 | lb. | .125 | |
| Defoamer 115a | lb. | .50 | |
| NDW | lb. | .215 | .235 |
| Dispersing Agents | | | |
| Blancol | lb. | .1525 | .26 |
| N | lb. | .155 | .26 |
| Darvan Nos. 1, 2, 3 | lb. | .22 | .30 |
| Daxad 11, 21, 23, 27 | lb. | .08 | .30 |
| Dispersaid H7A | lb. | .58 | |
| 1159 | lb. | .43 | |
| Emulphor ON-870 | lb. | .50 | .70 |
| Igepal CO-630 | lb. | .2875 | .47 |
| Igepon T-73 | lb. | .285 | .495 |
| T-77 | lb. | .45 | .69 |
| Indulins | lb. | .06 | .08 |
| Kreelons | lb. | .132 | .155 |
| Laurelton Oil | lb. | .18 | |
| Leonil SA | lb. | .52 | .65 |
| Lomar PW | lb. | .18 | |
| Marasperse CB | lb. | .1225 | .1425 |
| N | lb. | .095 | .105 |
| Modicols | lb. | .17 | .58 |
| Nekal BA-75 | lb. | .395 | .54 |
| BX-76 | lb. | .63 | .75 |
| Nopco 1287 | lb. | .155 | .195 |
| Orzan A | lb. | .0325 | |
| S | lb. | .0425 | |
| Pluronics | lb. | .335 | .40 |
| Polyfons | lb. | .08 | .09 |
| Sorapon SF-78 | lb. | .28 | .40 |
| Tergitol 7 | lb. | .4125 | .44 |
| NPX | lb. | .275 | .3074 |
| TMN | lb. | .2875 | .32 |
| Trenmine W-30 | lb. | .15 | |
| W-40 | lb. | .60 | .75 |
| Triton R-100 | lb. | .12 | .25 |
| X-100, -102, -114 | lb. | .255 | .36 |
| Dispersions | | | |
| Agebest 1293-22 | lb. | 1.90 | 2.00 |
| AgeRite Alba | lb. | 3.00 | |
| Powder, Resin D | lb. | .80 | |
| White | lb. | 1.80 | |
| Altax | lb. | .75 | |
| Shield No. 2, 6 | lb. | .08 | |
| 3 | lb. | .095 | |
| 4-35 | lb. | .09 | |
| 5 | lb. | .093 | |
| 7-F, 8 | lb. | .165 | |
| 55 | lb. | .18 | |
| Iron Oxide, 60% | lb. | .40 | |
| L.S.W. | lb. | 1.50 | |
| No. 305 Liquizinc | lb. | .30 | .35 |
| P-33 | lb. | .35 | |
| Rotax | lb. | .75 | |
| Sulfur | lb. | .13 | .15 |
| Telloy | lb. | 3.62 | |
| Tuads, Methyl | lb. | 1.60 | |
| Vulcacure NB | lb. | .45 | |
| NS | lb. | .75 | 1.05 |
| T.M.D. | lb. | 1.14 | |
| ZB, ZE, ZM | lb. | .85 | .89 |
| Vulcanizing, C group | lb. | .40 | 1.30 |
| G group | lb. | .45 | .90 |
| N group | lb. | .40 | 1.00 |
| Zetax | lb. | .75 | |
| Zimates, Butyl | lb. | 1.30 | |
| Ethyl, Methyl | lb. | 1.35 | |
| Zinc oxide | lb. | .40 | |
| Emulsions | | | |
| AgeRite Spar | lb. | 1.00 | |

Emulsions (*cont'd*)

| | | | |
|---|---|---|---|
| AgeRite Stalite | lb. | $0.75 | |
| Superiite | lb. | 1.00 | |
| Borden Arcco A-25, A-26 | | | |
| 7 16-30 | lb. | .18 | $0.19 |
| 555-40R | lb. | .185 | .2025 |
| 620-32B | lb. | .20 | .21 |
| 716-35 | lb. | .17 | .18 |
| 1041-21 | lb. | .165 | .175 |
| Habuco Resin Nos. 502, | | | |
| 515, 523 | lb. | .195 | .20 |
| 503 | lb. | .22 | .225 |
| 504, 526 | lb. | .19 | .195 |
| 517 | lb. | .175 | .18 |
| 524 | lb. | .155 | .16 |
| Resin A-2 | lb. | .16 | .25 |
| P-370 | lb. | .175 | .25 |
| X-210 | lb. | .12 | .22 |
| Freeze-Stabilizer 322 | lb. | .40 | |
| 12116C | lb. | .52 | |
| Hyonic PE 250 | lb. | .255 | .295 |
| Igepon T-43 | lb. | .145 | .35 |
| T-51 | lb. | .125 | .285 |
| -73 | lb. | .285 | .495 |
| Ludox | lb. | .1675 | .195 |
| Marmix | lb. | .41 | .48 |
| Merac | lb. | .75 | 1.05 |
| Micronex, colloidal | lb. | .06 | .072 |
| Modical S | lb. | .3084 | .3284 |
| VD | lb. | .1384 | .1584 |
| Monsanto Blue 4685 WD | lb. | 1.60 | |
| Green 4884 WD | lb. | 1.80 | |
| Red 127 | lb. | 1.25 | |
| OPD 101 | lb. | .16 | .26 |
| Picco Latex Plasticizer A-12 | lb. | .069 | .096 |
| Pliolite Latex 150, 190 | lb. | .32 | .41 |
| 170 | lb. | .37 | .46 |
| Polyvinyl methyl ether | lb. | .25 | .45 |
| Resin V | lb. | .13 | |
| Roelgel 100C | lb. | .46 | |
| Santomerse #3 Paste | lb. | .26 | .30 |
| Sellogen Gel | lb. | .1275 | |
| Sequestrene AA | lb. | .905 | .975 |
| ST | lb. | .585 | .615 |
| 30A | lb. | .245 | .265 |
| Setsit #5 | lb. | .75 | 1.05 |
| #9 | lb. | .85 | 1.15 |
| Stablex A | lb. | .80 | 1.10 |
| B, G | lb. | .50 | .95 |
| K | lb. | .27 | .35 |
| P | lb. | .35 | .50 |
| T | lb. | .14 | .22 |
| Surfactol 13 | lb. | .345 | .36 |
| Vult-Accel E | lb. | .85 | .92 |
| Webnix | lb. | 1.50 | 2.50 |

## Mold Lubricants

| | | | |
|---|---|---|---|
| A-C Polyethylene | lb. | .275 | .52 |
| Acintol D | lb. | .0625 | .085 |
| Alipal CO-433 | lb. | .25 | .45 |
| CO-436 | lb. | .22 | .41 |
| Aquarex Compounds | lb. | .21 | .94 |
| Carbowax 200, 300, 400 | lb. | .22 | .25 |
| 1500 | lb. | .225 | .2825 |
| 4000 | lb. | .31 | .32 |
| 6000 | lb. | .35 | .36 |
| Castorwax | lb. | .3375 | .3575 |
| Colite Concentrate | gal. | .90 | 1.15 |
| D-Tak Dip #10 | gal. | 1.50 | |
| DC Mold Release Fluid | lb. | 3.14 | 4.75 |
| 200 Fluid | lb. | 3.14 | 4.75 |
| Compound 4, 7 | lb. | 5.13 | 6.50 |
| Emulsion 7 | lb. | 1.20 | 1.74 |
| 8, 35, 35A, 35B, 36 | lb. | 1.20 | 1.74 |
| ELA | lb. | .82 | |
| FT Wax 200 | lb. | .265 | .42 |
| 300 | lb. | .295 | .45 |
| Glycerized Liquid Lubricant, | | | |
| concentrated | gal. | 1.25 | 1.63 |
| Igepals | lb. | .2875 | .74 |
| Igepon AP-78 | lb. | .44 | .68 |
| T-43 | lb. | .145 | .35 |
| -51 | lb. | .125 | .285 |
| -73 | lb. | .285 | .495 |
| L-45 Silicone Oil | lb. | 2.90 | 4.61 |
| LE-45 Silicone Oil Emulsion | lb. | 1.15 | 1.69 |
| -450 Silicone Emulsion | lb. | 1.15 | 1.69 |
| L-520 Organo-Silicone Fluid | lb. | 2.46 | 3.50 |
| -522 Organo-Silicone Fluid | lb. | 2.68 | 3.50 |
| Lubrex | lb. | .27 | .32 |
| Lubri-Flo | gal. | 10.00 | 12.05 |
| Lustermold | lb. | .41 | |
| Mold Lubricant No. 426 | lb. | .18 | |
| Paste | lb. | .25 | |
| Monopole Oil | lb. | .16 | |
| Monten Wax | lb. | .57 | |
| MR-22 | gal. | 9.95 | 14.95 |
| Para Lube | lb. | 0.46 | .048 |
| Paraflint RG and RGU Synthetic Wax | lb. | .15 | .22 |
| Plaskon 8406, 8407 | lb. | .30 | .37 |
| 8416, 8417 | lb. | .35 | .42 |
| 8429 | lb. | .40 | .47 |
| Pluronics | lb. | .335 | .44 |
| Poly-Brite PE-20 | lb. | .28 | .42 |
| 600 | lb. | .42 | .58 |
| Poly-Cone 125X | lb. | 1.20 | 1.40 |
| 1000 | lb. | .93 | 1.06 |
| Polyglycol E series | lb. | .29 | .42 |
| RA-1, -2, -3 | gal. | 2.25 | 3.00 |
| Rubber Glo | gal. | .94 | .97 |
| Silrex S-1 | lb. | .65 | |
| SM-33, -55, -61, -62 | lb. | 1.22 | 1.76 |
| Soap, Hawkeye | lb. | 1.25 | 1.45 |
| Purity | lb. | .155 | .165 |
| Sodium stearate | lb. | .40 | |
| Stoner's 700 series | gal. | 1.20 | 1.25 |
| Stoner's 800 series | gal. | $1.26 | $1.70 |
| 900 series | gal. | 1.55 | 2.55 |
| A series | gal. | 1.80 | 4.50 |
| Ucon 50-HB Series | lb. | .25 | .375 |
| Ulco | lb. | .12 | .23 |
| Vanfre | gal. | 1.95 | 3.00 |
| XLE-420 Silicone Oil | | | |
| Emulsion | lb. | 1.18 | 1.70 |

## Odorants

| | | | |
|---|---|---|---|
| Alamasks | lb. | .75 | 6.50 |
| Coumarin | lb. | 2.95 | 3.55 |
| Ethavan | lb. | 6.75 | 7.35 |
| Latex Perfume #7 | lb. | 4.00 | |
| Neutroleum Gamma | lb. | 3.60 | |
| Rodo | lb. | 4.00 | 5.50 |
| Rubber Perfume #10 | lb. | 2.60 | |
| Vanillin, Monsanto | lb. | 3.00 | 3.15 |

## Plasticizers and Softeners

| | | | |
|---|---|---|---|
| Acintol DLR | lb. | .0625 | .085 |
| Adipol 2EH, 10A, XX | lb. | .40 | .44 |
| BCA | lb. | .45 | .475 |
| ODY | lb. | .40 | .44 |
| Admex 710 | lb. | .3325 | .3625 |
| 711 | lb. | .3325 | .3825 |
| 744 | lb. | .3925 | .3825 |
| Aro Lene #1980 | lb. | .10 | .12 |
| Baker AA Oil | lb. | .195 | .24 |
| Crystal O Oil | lb. | .21 | .255 |
| Processed oils | lb. | .215 | .235 |
| Bardol, 639 | lb. | .0275 | .0375 |
| B | lb. | .055 | .065 |
| Benzoflex 2-45 | lb. | .26 | .29 |
| 9-88 | lb. | .27 | .30 |
| Bondogen | lb. | .555 | .605 |
| BRC-20 | lb. | .022 | .0245 |
| 22 | lb. | .026 | .0285 |
| 30 | lb. | .0165 | .025 |
| 521 | lb. | .023 | |
| BRH 2 | lb. | .0341 | .0351 |
| BRS 700 | lb. | .036 | |
| BRT 7 | lb. | .035 | .036 |
| BRV | lb. | .0625 | .065 |
| Bunarex Liquid | lb. | .0875 | .0925 |
| Resins | lb. | .085 | .095 |
| Bunatak AH | lb. | .085 | .095 |
| N | lb. | .31 | |
| U | lb. | .175 | |
| 83 | lb. | .0685 | |
| 90 | lb. | .09 | |
| 210 | lb. | .14 | |
| Bunnatol G, S | lb. | .40 | .505 |
| Butac | lb. | .1735 | .1835 |
| Butyl stearate, comml | lb. | .255 | |
| B-17 | lb. | .22 | .26 |
| Binney & Smith | lb. | .23 | .26 |
| FMC | lb. | .2725 | .2825 |
| Harchem | lb. | .2525 | .3425 |
| Kessoflex | lb. | .245 | .275 |
| Butyl stearate—G.P. | lb. | .0125 | .02 |
| R-100 | lb. | .045 | .0525 |
| TT | lb. | .017 | .02 |
| Califlux 510, 550 | lb. | .0275 | .0375 |
| G.P. | lb. | .015 | .0225 |
| R-100 | lb. | .0475 | .0575 |
| T-T | lb. | .019 | .0295 |
| Capryl alcohol, comml | lb. | .195 | .30 |
| Columbian Carbon | lb. | .195 | .30 |
| Harchem | lb. | .195 | .30 |
| Chlorowax 40 | lb. | .1625 | .1825 |
| 70 | lb. | .185 | .245 |
| -S | lb. | .21 | .27 |
| Circo light | gal. | .17 | |
| Circosol-2XH | gal. | .185 | |
| Contogums | lb. | .0875 | .111 |
| Cumar Resins | lb. | .065 | .17 |
| DBM (dibutyl-m-cresol) | | | |
| Darax | lb. | .32 | .3475 |
| DBP (dibutyl phthalate), | | | |
| comml | lb. | .26 | .40 |
| Darex | lb. | .30 | .33 |
| Eastman | lb. | .285 | .325 |
| Harflex 140 | lb. | .275 | .315 |
| Harwick Std. Chem. Co. | lb. | .325 | .385 |
| Hatco | lb. | .30 | .33 |
| Monsanto | lb. | .285 | .325 |
| Naugatuck | lb. | .30 | .33 |
| PX-104 | lb. | .26 | .30 |
| Rubber Corp. of America | lb. | .285 | .44 |
| Sherwin-Williams | lb. | .30 | .33 |
| DBS (dibutylsebacate) | | | |
| comml | lb. | .66 | .69 |
| Eastman | lb. | .655 | .685 |
| Harflex 40 | lb. | .655 | .685 |
| Hatco | lb. | .66 | .685 |
| Monoplex | lb. | .66 | .675 |
| Naugatuck | lb. | .665 | .69 |
| PX-404 | lb. | .665 | .685 |
| DCP (dicaprylphthalate), | | | |
| comml | lb. | .295 | .325 |
| Harflex 180 | lb. | .26 | .30 |
| Hatco | lb. | .295 | .325 |
| Monoplex | lb. | .30 | .315 |
| DDA (didecyladipate) | | | |
| Good-rite GP-236 | lb. | .40 | .59 |
| Kessoflex | lb. | .40 | .435 |
| DDP (didecylphthalate) | | | |
| Good-rite GP-266 | lb. | .295 | .45 |
| Hatco | lb. | .305 | .435 |
| Defoamer X-3 | lb. | .355 | |
| DIBA (diisobutyladipate) | | | |
| Darex | lb. | .4325 | .4625 |
| Eastman | lb. | .40 | .44 |
| Ohio-Apex | lb. | .41 | .45 |
| DIDA (diisodecyladipate) | | | |
| Monsanto | lb | $0.40 | $0.44 |
| RC | lb. | .40 | .44 |
| DIDP (diisodecylphthalate) | | | |
| Darex | lb. | .32 | .35 |
| Harflex 110 | lb. | .265 | .305 |
| Monsanto | lb. | .26 | .30 |
| Ohio-Apex | lb. | .41 | .45 |
| PX-120 | lb. | .26 | .30 |
| RC | lb. | .265 | .305 |
| Dielex B | lb. | .06 | |
| Diethylene glycol, comml | lb. | .1525 | .1825 |
| Wyandotte | lb. | .15 | .165 |
| Di-2 ethylhexyl azelate | lb. | .455 | .495 |
| Dinopol IDO | lb. | .265 | .305 |
| DIOA (diisooctyladipate) | | | |
| Kessoflex | lb. | .40 | .435 |
| Naugatuck | lb. | .435 | .465 |
| PX-208 | lb. | .40 | .435 |
| Rubber Corp. of America | lb. | .40 | .44 |
| DIOP (diisooctylphthalate), | | | |
| comml | lb. | .305 | .335 |
| Darex | lb. | .32 | .35 |
| Eastman | lb. | .25 | .29 |
| Harflex 120 | lb. | .26 | .30 |
| Hatco | lb. | .305 | .335 |
| Monsanto | lb. | .26 | .30 |
| Naugatuck | lb. | .305 | .335 |
| Ohio-Apex | lb. | .26 | .30 |
| PX-108 | lb. | .26 | .30 |
| Rubber Corp. of America | lb. | .26 | .30 |
| Sherwin-Williams | lb. | .32 | .34 |
| DIOS (diisooctylsebacate), | | | |
| comml | lb. | .61 | .64 |
| Rubber Corp. of America | lb. | .5925 | .6325 |
| DIOZ (diisooctylazelate) | | | |
| Cabflex | lb. | .48 | .51 |
| Dipolymer Oil | gal. | .33 | .48 |
| Dispersing Oil No. 10 | lb. | .06 | .0625 |
| DNODA (di-n-octyl-n-decyl adipate), Monsanto | lb. | .40 | .44 |
| DOA (dioctyladipate), | | | |
| comml | lb. | .425 | .455 |
| Eastman | lb. | .40 | .44 |
| Good-rite GP-233 | lb. | .40 | .55 |
| Harflex 250 | lb. | .40 | .435 |
| Hatco | lb. | .435 | .465 |
| Monsanto | lb. | .40 | .44 |
| Naugatuck | lb. | .435 | .465 |
| PX-238 | lb. | .40 | .435 |
| Rubber Corp. of America | lb. | .40 | .44 |
| DOP (dioctylphthalate), | | | |
| comml | lb. | .305 | .335 |
| Darex | lb. | .32 | .35 |
| Eastman | lb. | .26 | .30 |
| Good-rite GP-261 | lb. | .285 | .44 |
| Harflex 150 | lb. | .26 | .30 |
| Hatco | lb. | .305 | .335 |
| Monsanto | lb. | .26 | .30 |
| Naugatuck | lb. | .305 | .335 |
| Ohio-Apex | lb. | .25 | .29 |
| Polycizer 162 | lb. | .28 | .435 |
| PX-138 | lb. | .25 | .29 |
| Rubber Corp. of America | lb. | .25 | .30 |
| Sherwin-Williams | lb. | .305 | .335 |
| DOS (dioctylsebacate) | | | |
| comml | lb. | .61 | .64 |
| Eastman | lb. | .61 | .64 |
| Harflex 50 | lb. | .5925 | .6225 |
| Hatco | lb. | .61 | .635 |
| Monoplex | lb. | .61 | .635 |
| Naugatuck | lb. | .615 | .64 |
| PX-438 | lb. | .5925 | .6225 |
| Rubber Corp. of America | lb. | 5925 | .6325 |
| Drapex 3.2 | lb. | .40 | .54 |
| Dutch Boy NL-A10 (DBP) | lb. | .30 | .33 |
| -A20 (DOP), A30 (DIOP) | lb. | .305 | .335 |
| -A54 | lb. | .295 | .325 |
| -C20 (DOS) | lb. | .61 | .63 |
| -F21 | lb. | .395 | .425 |
| -F31 | lb. | .44 | .47 |
| -F41 | lb. | .48 | .51 |
| Dutrex 6 | lb. | .025 | .035 |
| Dymerex Resin | lb. | .135 | .1475 |
| Elastex 36-R | lb. | .43 | .4625 |
| 37-R | lb. | .70 | .71 |
| Emulphor EL-719 | lb. | .52 | .73 |
| Endor | lb. | .67 | |
| Ethox | lb. | .43 | .455 |
| Ethylene glycol, comml | lb. | .135 | .165 |
| Wyandotte | lb. | .1325 | .1425 |
| Flexol 3 GH | lb. | .44 | .46 |
| 3 GO | lb. | .53 | .55 |
| 4 GO | lb. | .325 | .355 |
| 10-A | lb. | .425 | .455 |
| 426 | lb. | .27 | .30 |
| 810, 810X, 10-10, 10-10X | lb. | .305 | .335 |
| TPF, A-26 | lb. | .435 | .465 |
| Flexricin P-4 | lb. | .3475 | .3625 |
| P-6 | lb. | .415 | .43 |
| Flexricin P-8 | lb. | .3475 | .3625 |
| PG-16 | lb. | .335 | .35 |
| Fortex | lb. | .125 | .145 |
| Fura-Tone NC 1008 | lb. | .28 | |
| 1012 | lb. | .46 | |
| G. B. Asphaltic Flux | gal. | .097 | .177 |
| Naphthenic Neutrals | gal. | .125 | .215 |
| Process oil, light | lb. | .0275 | .0375 |
| Medium | lb. | .0375 | .0475 |
| Galex W-100 | lb. | .155 | .18 |
| W-100 D | lb. | .1525 | .1775 |
| Gilsowax B | lb. | .0975 | .11 |
| Harchemex | lb. | .24 | .285 |
| Harflex 300 | lb. | .58 | .615 |
| 325 | lb. | .4325 | .46 |
| 375 | lb. | .7425 | .83 |
| 500 | lb. | .315 | .41 |
| HB-20 | lb. | .15 | .185 |

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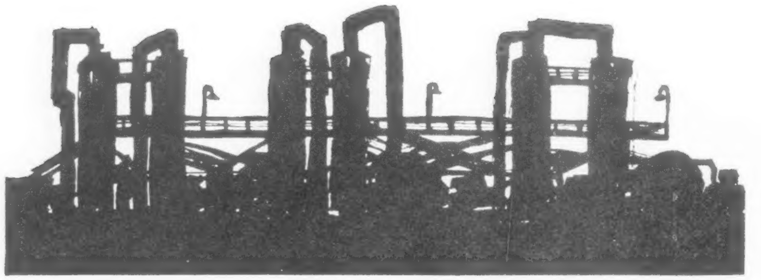
5—COLORING MATERIALS
6—SURFACE MATERIALS
7—AUXILIARY MATERIALS



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|---|---|---|---|
| HB-40 | lb. | $0.19 | $0.23 |
| Heavy Resin Oil | lb. | .0225 | .0375 |
| HSC-13 | lb. | .25 | .32 |
| -39 | lb. | .22 | .29 |
| Hycar 1312 | lb. | .60 | |
| Hypalon Peptizer H-20 | lb. | 1.59 | |
| Kapsol | lb. | .33 | .355 |
| Kenflex A, L | lb. | .26 | .27 |
| B | lb. | .23 | .24 |
| N | lb. | .18 | .19 |
| Kessoflex 103 | lb. | .405 | |
| 105 | lb. | .3325 | |
| 106 | lb. | .38 | |
| 107 | lb. | .525 | |
| 110 | lb. | .24 | |
| 111 | lb. | .28 | |
| KP-23 | lb. | .325 | .335 |
| -90 | lb. | .40 | .44 |
| -140 | lb. | .46 | .485 |
| -201 | lb. | .46 | .475 |
| -260 | lb. | .34 | .38 |
| Kronisol | lb. | .35 | .385 |
| Kronitex AA, I, K-3, MX | lb. | .325 | .36 |
| LX-685, -125, -135 | lb. | .125 | .135 |
| Marvinol plasticizers | lb. | .28 | .8825 |
| Methox | lb. | .39 | .425 |
| Millrex | lb. | .15 | |
| Monoplex S-38 | lb. | .215 | .24 |
| S-71 | lb | .45 | .475 |
| Morflex | lb. | .25 | .65 |
| Natac | lb. | .1685 | .1785 |
| Neoprene Peptizer P-12 | lb. | 1.18 | |
| W-9 | lb. | 2.28 | |
| Nevillac | lb. | .31 | .85 |
| Neville R Resins | lb. | .145 | .205 |
| Nevinol | lb. | .24 | |
| No. 1-D heavy oil | lb. | .065 | |
| NP-10 | lb. | .44 | .48 |
| ODA (octyldecyladipate) | | | |
| Good-rite GP-235 | lb. | .40 | .55 |
| Kessoflex | lb. | .40 | .435 |
| RC | lb. | 40 | .44 |
| ODP (octyldecylphthalate) | | | |
| Good-rite GP-265 | lb. | .29 | .445 |
| Hatco | lb. | .305 | .335 |
| Rubber Corp. of America | lb. | .265 | .305 |
| Ohopex Q-10 | lb. | .275 | .315 |
| R-9 | lb. | .3525 | .3775 |
| Orthonitro benzophenol, comml. | lb. | .13 | .15 |
| Palmalene | lb. | .15 | |
| Panaflex BN-1 | lb. | .185 | .225 |
| Panarez Resins | lb. | .09 | .14 |
| Para Flux, regular | gal. | .10 | .2125 |
| No. 2016 | gal. | .165 | .24 |
| 2332 | gal. | .11 | |
| 4205 | lb. | .1075 | .2125 |
| ParaLube | lb. | .46 | .48 |
| Resins | lb. | .04 | .045 |
| Paradene Resins | lb. | .07 | .08 |
| Paraplex 5-B | lb. | .29 | .3475 |
| Al-111 | lb. | .32 | .3275 |
| G-25 | lb. | .76 | .77 |
| -40 | lb. | .4825 | .51 |
| -50 | lb. | .39 | .4175 |
| -53 | lb. | .4325 | .46 |
| -60 | lb. | .325 | .35 |
| -62 | lb. | .345 | .37 |
| RG-7 | lb. | .33 | .335 |
| -8 | lb. | .505 | .5125 |
| -10 | lb. | .52 | .5275 |
| Pepton 22 | lb. | .83 | .86 |
| 65 | lb. | 1.23 | 1.26 |
| 65-B | lb. | .83 | .86 |
| Philrich 5 | gal. | .125 | |
| Picco Resins | lb. | .09 | .17 |
| 480 Oilproof Series | lb. | .18 | .23 |
| Aromatic Plasticizers | lb. | .075 | .095 |
| Liquid Resin D-165 (Y) | lb. | .06 | .075 |
| (Z-3) | lb. | .07 | .085 |
| (Z-6) | lb. | .08 | .095 |
| S. O. S. | gal. | .29 | .34 |
| Piccocizers | lb. | .05 | .07 |
| Piccolastic Resins | lb. | .21 | .27 |
| Piccolyte Resins | lb. | .205 | .245 |
| Piccopale Resins | lb. | .12 | .135 |
| Piccovars | lb. | .165 | .20 |
| Piccovol | lb. | .025 | .038 |
| Pictar | gal. | .25 | .40 |
| Pigmentar | lb. | .046 | .0634 |
| Pigmentaroil | lb. | .046 | .0634 |
| Pitch, Burgundy, Sunny South | lb. | .103 | .1085 |
| Pitt-Consol 500 | lb. | .28 | .305 |
| 640 | lb. | .42 | |
| Plasticizers | | | |
| 42 | lb. | .34 | .40 |
| 84 | lb. | .255 | .295 |
| B | lb. | .35 | .45 |
| DP-520 | lb. | .435 | .455 |
| MP | lb. | .035 | .0755 |
| MT-511 | lb. | .6925 | .7425 |
| ODN | lb. | .35 | .475 |
| SC | lb. | .38 | .55 |
| Plastoflex #3 | lb. | .52 | .57 |
| #520 | lb. | .36 | .435 |
| DBE | lb. | .50 | .55 |
| MGB | lb. | .29 | .37 |
| SP-2 | lb. | .43 | .48 |
| VS | lb. | .3575 | .3975 |
| Plastogen | lb. | .0875 | .09 |
| Plastone | lb. | .25 | .32 |
| Polycin 470 | lb. | .325 | .34 |
| Polycizers | lb. | .25 | .415 |
| 162 | lb. | .25 | .405 |
| Polymel-C | lb. | .1775 | .1875 |
| C-130, DX | lb. | .1375 | .1475 |
| D | lb. | .225 | .235 |
| D-TAC | lb. | .1975 | .215 |
| Poly-Sperse AP-2 | lb. | .23 | .295 |
| Poly-Sperse AP-300 | lb. | $0.26 | $0.325 |
| LC-20 | lb. | .26 | .325 |
| R-100 | lb. | .17 | .235 |
| PT Pine Tars | lb. | .044 | .063 |
| 101 Pine Tar Oil | lb. | .044 | .063 |
| RC Plasticizer PR | lb. | .28 | .43 |
| Reogen | lb. | .1425 | .145 |
| Resin C pitch | lb. | .0225 | .031 |
| R6-3 | lb. | .38 | .40 |
| Resinex 10, 25, 50, 110 | lb. | .04 | .045 |
| 70 | lb. | .0325 | .0375 |
| 85, 100 | lb. | .035 | .04 |
| 115 | lb. | .0375 | .0425 |
| L-2, L-3, L-4, L-5 | lb. | .0225 | .03 |
| Rosin Oil, Sunny South | gal. | .58 | .76 |
| RPA No. 2 | lb. | .85 | |
| 3 | lb. | .51 | |
| Conc. | lb. | .85 | |
| 6 | lb. | 1.66 | |
| RSN Flux | gal. | .10 | .91 |
| Rubber Oil B-5 | lb. | .0225 | .0355 |
| Rubberol | lb. | .18 | .2725 |
| Santicizer 1-H | lb. | .50 | .52 |
| 8 | lb. | .43 | .47 |
| 9 | lb. | .42 | .44 |
| 140 | lb. | .325 | .36 |
| 141 | lb. | .34 | .375 |
| 160 | lb. | .26 | .30 |
| 409 | lb. | .39 | .42 |
| 603 | lb. | .255 | .295 |
| B-16 | lb. | .46 | .49 |
| E-15 | lb. | .5225 | .5525 |
| Santocizer | lb. | .4275 | .4575 |
| Sebacic acid, purified, comml. | lb. | .59 | .65 |
| Binney & Smith | lb. | .64 | .76 |
| C. P.-Binney & Smith | lb. | .72 | .84 |
| Harchem | lb. | .655 | .815 |
| Sherolatum Petroleum | lb. | .05 | .10 |
| Softener #20 | gal. | .10 | .20 |
| Special Rubber Resin 100 | lb. | .1675 | .2175 |
| Staflex AX | lb. | .43 | |
| DBES | lb. | .61 | .635 |
| Syn-Tac | gal. | .33 | .635 |
| Synthol | lb. | .17 | .2625 |
| Tetraflex R-122 | lb. | .255 | .29 |
| Thiokol TP-90B | lb. | .59 | |
| -95 | lb. | .65 | |
| Triacetin | lb. | .37 | .41 |
| Tributyl phosphate | lb. | .50 | .535 |
| Tributyrin | lb. | .69 | |
| Tricresyl phosphate, comml. | lb. | .33 | .36 |
| Monsanto | lb. | .325 | .36 |
| Naugatuck | lb. | .33 | .36 |
| PX-917 | lb. | .33 | .36 |
| Triphenyl phosphate, comml. | lb. | .39 | .40 |
| Monsanto | lb. | .415 | .435 |
| Turgum S | lb. | .156 | .166 |
| SB | lb. | .105 | .115 |
| Turpol NC 1200 | lb. | .61 | .70 |
| Tysonite | lb. | .3025 | .305 |
| United | gal. | .69 | 1.20 |
| X-1 Resinous Oil | lb. | .0225 | .0325 |

## Reclaiming Oils

| | | | |
|---|---|---|---|
| Bardol, 639 | lb. | .0275 | .0375 |
| B | lb. | .055 | .065 |
| BRH 2 | lb. | .0213 | .0351 |
| BRT 3 | lb. | .02 | .031 |
| 4 | lb. | .02 | .031 |
| 7 | lb. | .035 | .036 |
| BRV | lb. | .0625 | .065 |
| Burco-RA | lb. | .053 | .0805 |
| BWH-1 | lb. | .16 | .17 |
| Dipolymer Oil | gal. | .33 | .48 |
| Dispersing Oil No. 10 | lb. | .06 | .0625 |
| G. B. Oils | gal. | .115 | .275 |
| Heavy Resin Oil | lb. | .0225 | .0375 |
| LX-572 | gal. | .27 | .32 |
| -759 | gal. | .1375 | |
| -777, -809, -859 | gal. | .23 | .33 |
| -869 | gal. | .33 | .43 |
| -871 | gal. | .34 | .44 |
| No. 3186 | gal. | .28 | .295 |
| Picco 6535 | gal. | .25 | .30 |
| C-33 | gal. | .215 | .385 |
| -42 | gal. | .23 | .40 |
| D-4 | gal. | .27 | .44 |
| E-5 | gal. | .25 | .35 |
| Q-Oil | gal. | .286 | .36 |
| Pitt-Consol 500 | lb. | .28 | .305 |
| 640 | lb. | .42 | |
| PT 101 Pine Tar Oil | lb. | .038 | .0554 |
| Reclaiming Oil #3186 | gal. | .28 | .385 |
| -G | gal. | .25 | .365 |
| 4039-M | gal. | .3275 | .3975 |
| -Y | gal. | .30 | .37 |
| RR-10 | lb. | .37 | |
| S. R. O. | lb. | .015 | .0225 |
| X-1 Resinous Oil | lb. | .0225 | .0325 |

## Reinforcers, Other Than Carbon Black

| | | | |
|---|---|---|---|
| Angelo Shellacs | lb. | .485 | .7325 |
| Borden, Chem. Div. | | | |
| Arcco 978-42B | lb. | .18 | .19 |
| 1073-18B | lb. | .135 | .145 |
| 1294-36B | lb. | .115 | .125 |
| 1301-12B | lb. | .15 | .16 |
| BRC-20 | lb. | .0235 | .0245 |
| 22 | lb. | .026 | .0285 |
| 30 | lb. | .0165 | .025 |
| 521 | lb. | .023 | |
| Bunarex Resins | lb. | .085 | .095 |
| Cab-o-sil | lb. | 66 | 1.45 |
| Calcene CO | ton | 105.00 | 125.00 |
| NC | ton | 80.00 | 100.00 |
| TM | ton | 82.50 | 102.50 |
| Car-Bel-Rez C | lb. | $0.126 | $0.1451 |
| Clays | | | |
| A. F. D. Filler | ton | 29.50 | 36.00 |
| Aiken | ton | 14.00 | |
| Albacar | ton | 50.00 | 55.00 |
| Buca | ton | 45.00 | |
| Burgess Iceberg | ton | 50.00 | 80.00 |
| Icecap K | ton | 65.00 | 90.00 |
| Burgess Pigment #20 | ton | 35.00 | 60.00 |
| #30 | ton | 37.00 | 60.00 |
| Catalpo | ton | 35.00 | |
| Champion | ton | 14.50 | |
| Crown | ton | 14.00 | 33.00 |
| Dixie | ton | 14.50 | 15.00 |
| Franklin | ton | 13.50 | 35.25 |
| GK Soft Clay | ton | 11.00 | |
| Harwick | ton | 21.50 | 77.00 |
| Hi-White R | ton | 10.00 | 14.50 |
| Hydratex R | ton | 28.00 | |
| Kaolloid | ton | 10.50 | |
| L. G. B. | ton | 13.00 | 17.50 |
| L. G. P. | ton | 15.50 | 20.00 |
| McNamee | ton | 14.50 | 15.00 |
| RX-43 | ton | 33.00 | |
| Natka 1200 | ton | 13.00 | |
| Par | ton | 13.00 | 13.50 |
| Paragon | ton | 10.00 | 14.50 |
| Pigment No. 33 | ton | 37.00 | |
| Polyfil C | ton | 25.00 | |
| F | ton | 45.00 | |
| X | ton | 30.00 | |
| 40 | ton | 40.00 | |
| 70 | ton | 53.00 | |
| 80 | ton | 65.00 | |
| Recco | ton | 14.00 | |
| Sno-Brite | ton | 12.50 | |
| Stan-Clay | ton | 28.00 | |
| Stellar-R | ton | 50.00 | |
| Suprex | ton | 10.00 | 14.50 |
| Swanee | ton | 12.50 | |
| Whitetex | ton | 50.00 | |
| Windsor | ton | 14.00 | 30.00 |
| Witco No. 1 | ton | 14.00 | 30.00 |
| No. 2 | ton | 13.50 | 30.00 |
| Clearcarb | lb. | .1175 | .1255 |
| Cumar Resins | lb. | .095 | .19 |
| Darex Resins | lb. | .42 | .49 |
| DC Silica | lb. | 1.15 | 1.40 |
| Diatomaceous silica | ton | 32.00 | 48.00 |
| Good-rite 2007 | lb. | .36 | .38 |
| 2057 | lb. | .30 | .31 |
| Hi-Sil 233 | lb. | .0825 | .0975 |
| X303 | lb. | .40 | .45 |
| Hycar 2001 | lb. | .55 | |
| 2007 | lb. | .39 | |
| Indulins | lb. | .06 | .08 |
| Kralac A-EP | lb. | .43 | .54 |
| Laminar | ton | 30.00 | |
| Magnesium carbonate | | | |
| DCI | lb. | .11 | |
| Magcarb L | lb. | .11 | .14 |
| Marbon Resins | lb. | .36 | .43 |
| Multifex MM | ton | 117.50 | 137.50 |
| Super | ton | 167.50 | 187.50 |
| Neville Resins | | | |
| 465 | lb. | .075 | .08 |
| LX-509 | lb. | .33 | .35 |
| Nebony | lb. | .045 | .05 |
| Paradene | lb. | .07 | .08 |
| R | lb. | .145 | .205 |
| Para Resins 2457 | lb. | .04 | .045 |
| Parapol S-Polymers | lb. | .44 | |
| Picco Resins | lb. | .0850 | .19 |
| Piccolyte Resins | lb. | .2225 | .2525 |
| Piccoumaron Resins | lb. | .0875 | .19 |
| Piccovars | lb. | .145 | .20 |
| Pliolite NR types | lb. | .98 | 1.33 |
| S-3 | lb. | .42 | .49 |
| -6 | lb. | .36 | .43 |
| B | lb. | .36 | .43 |
| E | lb. | .36 | .43 |
| Plio-Tuf G85C | lb. | .52 | .59 |
| Purecal M | ton | 56.75 | 71.75 |
| SC, T | ton | 110.00 | 125.00 |
| U | ton | 120.00 | 135.00 |
| R-B-H 510 | lb. | .15 | .22 |
| Resinex | lb. | .0375 | .0525 |
| Rubber Resin LM-4 | lb. | .28 | .35 |
| Silene EF | lb. | .06 | .07 |
| L | lb. | .0575 | .0675 |
| Silvacons | ton | 55.00 | 85.00 |
| Transphalt | lb. | .0375 | .0575 |
| Witcarb P | ton | 117.50 | 153.50 |
| R | ton | 127.50 | 163.50 |
| Regular | ton | 60.00 | 96.00 |
| Zeolex 23 | lb. | .06 | .07 |
| Zinc oxide, commercial† | lb. | .145 | .155 |

## Retarders

| | | | |
|---|---|---|---|
| Benzoic acid TBAO-2 | lb. | .44 | |
| Good-rite Vultrol | lb. | .62 | .66 |
| R-17 Resin | lb. | .1075 | .36 |
| Retarder ASA | lb. | .57 | |
| E-S-E-N | lb. | .39 | .41 |
| J | lb. | .68 | .70 |
| PD | lb. | .39 | .41 |
| W | lb. | .46 | |
| Retardex | lb. | .47 | .50 |
| Thionex | lb. | 1.14 | |
| Wiltrol P | lb. | .37 | .39 |

## Solvents

| | | | |
|---|---|---|---|
| Bondogen | lb. | .555 | .608 |
| Butyrolactone | lb. | .60 | .65 |
| Cosol #1 | gal. | .37 | .43 |
| #2 | gal. | .42 | .48 |
| Dichloro Pentanes | lb. | .04 | .07 |

| | | | |
|---|---|---|---|
| Dipentene DD, Sunny South | gal. | $0.42 / | $0.63 |
| Ethylene dichloride, comml | lb. | .09 / | .122 |
| Hi-Flash 2-50-W | gal. | .41 | |
| Pale yellow | gal. | .39 | |
| LX-572 | gal. | .27 / | .32 |
| -748 | gal. | .16 / | .23 |
| Methyl-2-pyrrolidone | lb. | .75 / | .80 |
| Neville Nos. 100, 104 | gal. | .52 / | .60 |
| 106 | gal. | .38 / | .46 |
| Nevsolv H, 200 | gal. | .19 / | .29 |
| HF, T, 30 | gal. | .24 / | .34 |
| Penetrell | gal. | .42 / | .63 |
| Picco Hi-Solv Solvents | gal. | .16 / | .48 |
| Pine Oil DD, Sunny South | lb. | .15 | |
| Skellysolve-B | gal. | .17 | |
| -C | gal. | .162 | |
| -H | gal. | .148 | |
| -R, -V | gal. | .139 | |
| Stauffer Carbon Disulfide | lb. | .0525/ | .085 |
| Tetrachloride | lb. | .0825/ | .475 |

## Tackifiers

| | | | |
|---|---|---|---|
| Actinol DLR | lb. | .0625/ | .085 |
| Bardol, 639 | lb. | .0275/ | .0375 |
| Borden, Arcco | | | |
| A25, A26, 716-30 | lb. | .18 / | .19 |
| 555-40R | lb. | .185 / | .205 |
| 620-32B | lb. | .20 / | .21 |
| 716-35 | lb. | .17 / | .18 |
| 1041-21 | lb. | .165 / | .175 |
| BRH 2 | lb. | .0213/ | .0351 |
| Bunarex Resins | lb. | .065 / | .1225 |
| Bunaweld 480 | lb. | .24 | |
| Chlorowax 70 | lb. | .18 / | .24 |
| Contogums | lb. | .0875/ | .11 |
| Cumar Resins | lb. | .095 / | .19 |
| Galex W-100 | lb. | .155 / | .17 |
| W-100D | lb. | .1525/ | .1625 |
| Indopol H-35 | gal. | .65 / | .84 |
| H-50 | gal. | .70 / | .89 |
| -100 | gal. | .85 / | 1.08 |
| -300 | gal. | 1.00 / | 1.24 |
| -1500 | gal. | 1.48 | |
| L-10 | gal. | .40 / | .59 |
| -50 | gal. | .45 / | .64 |
| -100 | gal. | .55 / | .74 |
| Kenflex resins | lb. | .18 / | .27 |
| Koresin | lb. | .90 / | 1.10 |
| Natac | lb. | .1685/ | .1785 |
| Nevindene | lb. | .15 / | .18 |
| Picco Resins | lb. | .0875/ | .19 |
| Piccolastic Resins | lb. | .21 / | .27 |
| Piccolyte Resins | lb. | .2225/ | .2525 |
| Piccopale Resins | lb. | .089 / | .13 |
| Piccoumaron Resins | lb. | .0875/ | .19 |
| R-B-H 510 | lb. | .15 / | .22 |
| Roelflex 1118A | lb. | .39 | |
| Synthetic 100 | lb. | .41 | |
| Synthol | lb. | .26 / | .3025 |
| United | gal. | .69 / | 1.20 |
| Vistanex, LM grades | lb. | .45 | |

## Vulcanizing Agents

| | | | |
|---|---|---|---|
| Dibenzo G-M-F | lb. | 2.60 | |
| G-M-F #113, #117 | lb. | .90 | |
| Di-Cup | lb. | 1.10 | |
| Dodecenyl succinicanhydride | lb. | .75 / | .76 |
| HMDA-Carbamate | lb. | 4.50 / | 4.90 |
| Ko-Blend I, S | lb. | .39 | |
| Litharge (*See Accelerator-Activators, Inorganic*) | | | |
| Magnesium oxide | lb. | .2525/ | .38 |
| DCI | lb. | .215 / | .235 |
| 601 | lb. | .2525 | |
| Maglite D, K, Y | lb. | .2525/ | .28 |
| M | lb. | .27 / | .30 |
| Marmag | lb. | .23 / | .265 |
| Michigan No. 1782 | lb. | .2525/ | .30 |
| PSD 85 | lb. | .37 / | .50 |
| Red Lead (*See Accelerator-Activators, Inorganic*) | | | |
| Seamag | lb. | .20 / | .22 |
| Sulfasan R | lb. | 1.55 | |
| Sulfur flour, comml. | 100 lbs. | 2.55 / | 3.30 |
| 1018 | lb. | .12 / | .1575 |
| Aero | 100 lbs. | 2.40 / | 7.75 |
| Crystex | lb. | .195 / | .23 |
| Insoluble 60 | lb. | .125 / | .13 |
| Rubbermakers | 100 lbs. | 2.65 / | 4.55 |
| Stauffer | lb. | .0265/ | .054 |
| Telloy | lb. | 4.00 | |
| VA-7 | lb. | .50 | |
| Vandex | lb. | 7.00 | |
| Vultac No. 2 | lb. | .47 / | .74 |
| 3 | lb. | .51 / | .78 |
| White lead silicate (*See Accelerator-Activators, Inorganic*) | | | |

## Synthetic Rubbers

*(Continued from page 135)*

| | | |
|---|---|---|
| Plioflex 1703, 1773 | $0.206[c] / | $0.212[c] |
| 1710C, 1712C | .1885[c]/ | .1945[c] |
| 1713 | .175[c] / | .181[c] |
| 1714C | .1725[c]/ | .1785[c] |
| 1773 | .206[c] / | .212[c] |
| 1778 | .191[c] / | .197[c] |
| Polysar Krynol 651 | | .1885[c] |
| 652 | | .191[c] |
| S-1703 | | $0.195[a] |
| -1707 | | .18[a] |
| -1709, -1710, -1712 | | .1775[a] |
| -1778 | | .18[a] |
| Synpol 1703 | $0.206[b] / | .212[b] |
| 1707, 1708 | .191[b] / | .197[b] |
| 1712 | .1885[b]/ | .1945[b] |
| Synpol 8200 | .191[b] / | .197[b] |
| 8201, 8208 | .175[b] / | .181[b] |
| 8202 | .1725[b]/ | .1785[b] |

### Cold SBR Oil-Black Masterbatch

| | | |
|---|---|---|
| Ameripol 1805 | .155[c] / | .161[c] |
| 1808 | .148[c] / | .154[c] |
| 1809 | .1545[c]/ | .1605[c] |
| 1810 | .140[c] / | .146[c] |
| 4756 | .1545[c]/ | .1605[c] |
| 4758 | .145[c] / | .151[c] |
| 4759 | .1598[c]/ | .1658[c] |
| 4760 | .1576[c]/ | .1636[c] |
| 4761 | .171[c] / | .177[c] |
| Baytown 1801 | | .176[b] |
| 1803 | | .174[b] |
| 1811 | | .1569[b] |
| 8775 | | .1545[b] |
| 8776 | | .1679[b] |
| 8777 | | .1550[b] |
| 8778 | | .148[b] |
| 8779 | | .1496[b] |
| 8780 | | .1507[b] |
| 8781 | | .1655[b] |
| 8782 | | .1583[b] |
| 8783 | | .1515[b] |
| Carbomix 3751, 3758 | .1545[c]/ | .1605[c] |
| 3753 | .164[c] / | .170[c] |
| 3757 | .148[c] / | .154[c] |
| 3760-NS | .1496[c]/ | .1556[c] |
| Gentro-Jet 9250 | | .158 |
| 9251 | | .164 |
| Gentro-Jet 9252 | | .167 |
| 9275 | | .150 |
| OB-102 | | .1825[a] |
| -104 | | .1475[a] |
| -110 | | .141[a] |
| Philprene 1803 | .174[b] / | .18[b] |
| 1805 | .155[b] / | .161[b] |
| 1808 | .148[b] / | .154[b] |
| Philprene 6753 | $0.1496[b]/ | $0.1556[b] |
| 6755 | .1715[b]/ | .1775[b] |
| S-1800 | | .1475[a] |
| -1802 | | .141[a] |
| -1803 | | .165[a] |
| -1806 | | .151[a] |
| -1807 | | .154[a] |
| -1808 | | .142[a] |
| Synpol 8253 | .1584[b]/ | .1644[b] |
| 8254 | .1545[b]/ | .1605[b] |
| 8255 | .148[b] / | .154[b] |
| 8267 | .164[b] / | .17[b] |

### Cold SBR Rosin Masterbatch

| | | |
|---|---|---|
| Copo 3900 | .231[c] / | .237[c] |

### Cold SBR Latex

| | | |
|---|---|---|
| CL-101 | | .28[a] |
| Copo 2101 | .30[c] / | .4025[c] |
| 2102, 2105, 2110 | .32[c] / | .3725[c] |
| 2108 | .30[c] / | .3675[c] |
| 2109 | .2775[c]/ | .3450[c] |
| 3852 | .30[c] | |
| FR-S 2105 | .32[c] / | .366[c] |
| Naugatex 2105, 2107 | .32[a] / | .38[a] |
| 2108 | .30[a] / | .38[a] |
| 2113 | .29[a] / | .36[a] |
| Pliolite Latex 2101 | | .30[c] |
| 2105, 2107 | | .32[c] |
| 2108 | | .30[c] |
| Polysar Latex 721 | | .32[c] |
| S-2101 | | .26[a] |
| -2105 | | .28[a] |
| -2107 | | .32[a] |
| -2108 | | .29[a] |

### Misc. SBR

| | | |
|---|---|---|
| FR-S-110 (latex) | .3000[c] | |
| -150 (latex) | .3000[c] | |
| -174 (latex) | .2950[c] | |
| -176 (latex) | .2775[c] | |
| -182 | .241[c] / | .247[c] |
| -184 | .1885[c]/ | .1945[c] |

### Urethane Types

| | | |
|---|---|---|
| Adiprene L, LD-167, -213 | 1.15 | 1.65 |

## CALENDAR of COMING EVENTS

*(Continued from page 121)*

February 7
The Los Angeles Rubber Group, Inc.

February 17
Detroit Rubber & Plastics Group, Inc.

February 24
Quebec Rubber & Plastics Group. Ladies Night. Victoria Hall, Westmount, P.Q., Canada.

March 7
The Los Angeles Rubber Group, Inc.

March 10
Chicago Rubber Group. Furniture Club, Chicago, Ill.

March 17
Boston Rubber Group. Hotel Somerset, Boston, Mass.

March 23
Quebec Rubber & Plastics Group.

March 24
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.

April 4
The Los Angeles Rubber Group, Inc.

April 7
Akron Rubber Group.

April 18-21
Division of Rubber Chemistry, ACS. Brown Hotel, Louisville, Ky.

April 19
Quebec Rubber & Plastics Group.

April 21
Detroit Rubber & Plastics Group, Inc.

April 28
Chicago Rubber Group. Furniture Club, Chicago, Ill.

May 2
The Los Angeles Rubber Group, Inc.

May 21
American Chemical Society. St. Louis, Mo.

June 2
Quebec Rubber & Plastics Group. Golf Outing. Ste. Hyacinthe, P.Q., Canada.

June 8
New York Rubber Group. Outing. Doerr's Grove, Millburn, N. J.

June 16
Akron Rubber Group.
Boston Rubber Group. Outing. Andover Country Club, Andover, Mass.

June 23
Detroit Rubber & Plastics Group, Inc.

June 23-24
Southern Rubber Group. Buena Vista Hotel, Biloxi, Miss.

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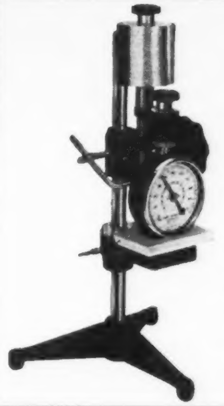

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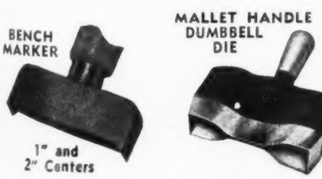


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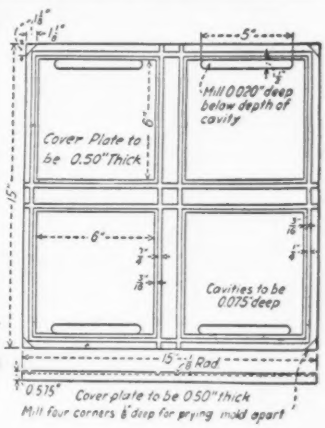


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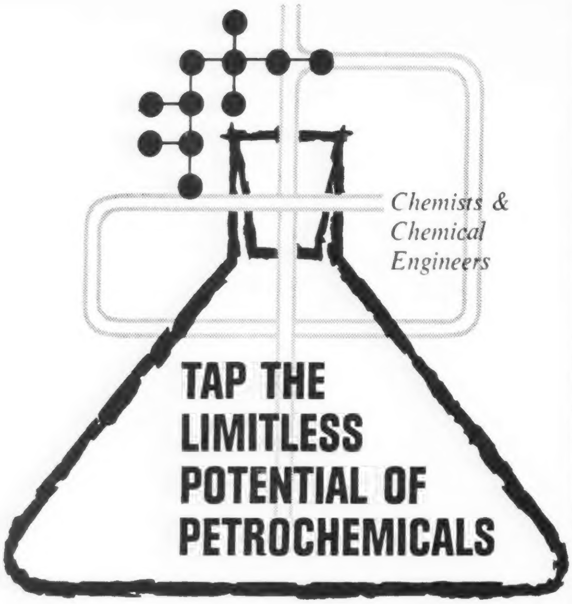


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